THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. APRIL 29, 1897. CHICAGO, ILL. NUMBER 17.

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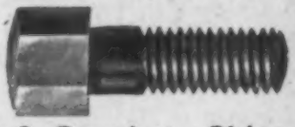

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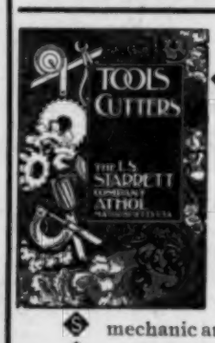

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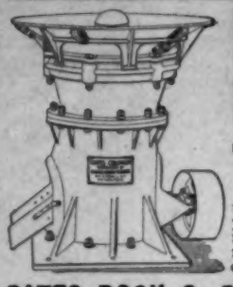

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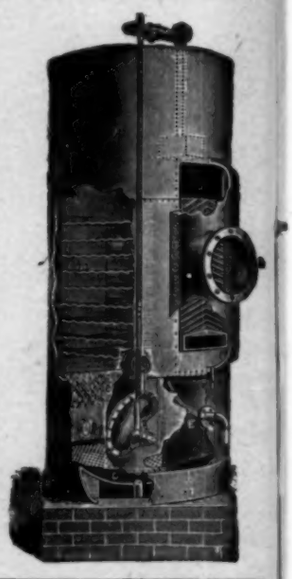

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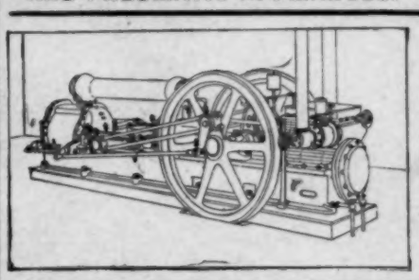

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. APRIL 29, 1897. CHICAGO, ILL. NUMBER 17

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

There are two features of the present situation in iron that mitigate some of its disappointments—they are the heavy consumption in many lines and the widening circle of those who see the beginning of the end of the desperately low prices on primary products. Perhaps this feeling is prompted in part by the experience that the acutest stage of a malady cannot long endure, but leaving experience out, it is not to be expected that prices will drop far when well-known cost for a large majority of producers has been passed. The fact that pig iron production was at the rate of 9,000,000 tons a year at the opening of the month, and that the rate of stock accumulations has lessened somewhat, points to a consumption that is apt to be lost sight of in the failure of many producers to get business enough to run with respectable regularity. The larger concerns are all fairly employed but their capacity has been increased in the past three or four years, so that a total of new business that in 1892 would have gone fairly around, now leaves very little to lap over for the smaller works. From the latter comes much of the complaint of scant business and losing prices. Bessemer steel is still finding a large outlet in wire and nails and in sheets and tin plate; but in the widening business bridge contracts have brought to steel works of late, open-hearth is very largely specified. In point of tonnage, bridge-building is probably the best dependence of the steel trade to-day, so far as new business goes. The 18,000-ton Montreal contract, and the work at Boston and Chicago are the largest jobs on hand, but in the Southwest there is a large amount of smaller work chiefly under public auspices. Central Western bridge works have taken a considerable share of going business, but have had to go some distance to get it, their nearest field yielding comparatively little at present. The range of prices on bars, plates, angles and sheets continues on the low level of the past few weeks. Bar iron at less than 1c a pound does not favor a renewal of the $4.50 puddling arrangement, and the breaking down of that rate in the Pittsburg district is now practically complete. The labor question, in fact, gives indication of being more of a factor in the next few months. Reductions have not been few thus far in the year; it is yet to be seen whether they will be as readily accepted as the summer months come on. The Bessemer pig iron market is sentimentally better. The extreme prices talked about of late are not the basis of actual business. Furnaces in the valley quote $9.50 for delivery in the second half of the year, though on the small sales of prompt iron made, a lower price has prevailed, and buyers claim to be able to get $9 iron. The Southern situation is unchanged. No. 2 foundry has sold in the neighborhood of $6.25 and $5.75 has been done on gray forge. There is no indication of any early curtailment of Birmingham production. Ore matters have made no special progress beyond some sales of Mesabi ores for Chicago consumption.

THE CLEVELAND DISTRICT.

Boats are now loading ore at some of the upper lake docks, but the opening of the season finds no readiness for it on the part of ore or vessel interests. The Illinois Steel Co. has closed within the week with the Minnesota Iron Co. for its 1897 supply of Mesabi ores, but the tonnage is not yet announced. Some other deals are pending that may soon result in sales. But in general the situation is a waiting one. So much pig iron on hand holds furnacemen back; so much ore on Lake Erie docks makes ore companies with consuming connections indifferent on the subject of charters. There would be entire satisfaction by most ore shippers with an arrangement that would delay the opening for at least a month. A season contract was made the past week covering 300,000 tons and upwards from Marquette at 65 cents. The usual difference between Marquette and the head of the lake would make the Ashland and Duluth rate 75 cents, to correspond; however, 70 cent tonnage has been offered, and short-season offers of 65 and 60 cents are reported. The expected reduction on rail freights to Ashland and Escanaba has been made. From Gogebic mines to Ashland the rate is now 45 cents instead of 52, and a like reduction has been made from Iron Mountain and points carrying the same rate, to Escanaba. From the Crystal Falls and Iron River districts, which have taken a 57-cent freight, the new rate is 48 cents.

Pig Iron. In addition to the valley furnaces heretofore reported as about to go out, two or three may take this step if there is no early change for the better. One Cleveland district furnace will probably stop when present ores are worked up. Rosena Furnace, at New Castle, passes into the hands of the owners Saturday, and will continue in operation. Dover Furnace at Canal Dover, O., blew in last week, after nine months' idleness. From the Mahoning valley it is reported that offers of $9.25 on Bessemer iron, deliveries in the second half of the year, have been refused, and that $9.50 is asked. Efforts have been made by buyers of the speculative Bessemer taken at $10.50 to $11 a few months ago, to make new purchases at $9 in the valley, and some of their storage iron has been sold meantime at $9.50 Pittsburg, while offers of other lots have been made at low prices. Foundry irons have been offered at figures plainly below cost, but some sellers refuse to meet the $9 to $9.25 basis on No. 2 which is reported in some cases. In forge iron nothing has been done. We quote:

Bessemer	$9 75@ 9 90	Valley Scotch No. 1	$10 65
No. 1 Strong Foundry	10 50@10 75	Valley Scotch No. 2	10 15
No. 2 Strong Foundry	9 90@10 25	Gray Forge	8 75@ 8 90
No. 3 Foundry	9 65@ 9 75	Lake Superior Charcoal	13 25@13 50

Finished Material. Ohio bridge works have taken considerable work lately and have more to figure on, most of it remote from this district. New building is of little moment, apart from the Cleveland Chamber of Commerce, which is to be let next week. At Columbus two new buildings are to be let, calling for a total of about 1,000 tons. Angles and plates are dragging at the bottom; on the former, 1.05c, delivered Cleveland, can be shaded, though 1.10c is the average quotation. Mills in the valley are doing little in merchant iron, and .95c to 1c is the common quotation on car load lots. We quote sheets at 1.95c to 2c for No. 27 common iron. In galvanized there is considerable activity. Tank steel has sold at 1.10c to 1.15c, Cleveland.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, April 28.

Last week was even more quiet than was the week before, but the first of this week business appeared to brighten up a little, as mails were heavier and buyers seemed a little more willing to consider making contracts. No large sales have been made in any branch of the market and the inquiries in hand do not denote any increase in business immediately, but there is more of a feeling in the trade that business will begin to improve soon than has been evident for several weeks past. The foundries in this locality are nearly all running light, but most of the mills are working full time, and while orders in hand for most products are not heavy, something comes up every little while to keep the mills running. The total of business is really not so much complained of as its hand-to-mouth character. No one is sure that he is going to get enough business any week to keep going. Collections are bad, and this has a tendency to retard trade. Prices are weak, and while no actual cuts have been made in the open quotations, no desirable orders come into the market that do not cause a little break in prices, as competition is so keen.

PIG IRON.—Both Northern and Southern furnaces report a quiet week, with only small orders closed and small inquiries received. The largest business was an order for to close 1,000 tons of Southern iron, which went at figures a little under those we give. The Southern dealers report a dull outlook, as they have only a light demand. Northern furnaces, on the other hand, say that the outlook is quite a little improved and that inquiries received the first of the present week are considerably more than they have had for the past few weeks, but at the same time they do not include any particularly large lots. Considerable business has been hanging fire lately, the final closing of which is contingent on the placing of contracts for the material into which the iron will be made. Whether this will finally result in anything is still undetermined. Prices are weak, and those on Northern irons would undoubtedly be shaded on anything like a desirable trade. The figures we give on Southern irons are very close, if not at the bottom, and very little business is going at lower prices. Rumors have been circulated regarding offers made by furnaces much lower than our figures, but these are not verified.

Lake Sup. Charcoal	$13 50@14 00	Southern No. 1 Soft	$10 65@10 90
Local Coke Fdy. No. 1	11 25@11 75	Southern No. 2 Soft	10 15@10 25
Local Coke Fdy. No. 2	10 75@11 25	South'n Silveries	11 40@11 65
Local Coke Fdy. No. 3	10 50@10 75	Jackson Co. Silveries	14 00@16 00
Local Scotch Fdy. No. 1	11 25@11 75	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	10 75@11 25	Ohio Silveries No 2	14 50@15 00
Local Scotch Fdy. No. 3	10 50@10 75	Ohio Strong Softeners	12 00@12 25
South'n Coke No. 1	11 00@11 25	Alabama Car Wheel	16 00@16 50
South'n Coke No. 2	10 25@10 40	Malleable Bessemer	11 50@12 00
South'n Coke No. 3	10 00@10 15	Coke Bessemer	13 00@13 50

BARS.—Except for the small lot trading that is going on in a desultory way, the market is lifeless, and seems likely to remain so for some time. No large contracts have come up lately, and none are in sight for the immediate future. A report has been circulated that a Southern road is taking figures on 1,000 cars, to be built immediately, but nothing definite could be secured regarding this. Prices are weak, steel bars being sold as low as 1c, and iron bars fully as low. The regular quotations, however, are slightly higher, and are made at 1.05c to 1.10c for common iron, and 1.05c to 1.10c for steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—A considerable inquiry is had for light section rails, and quite a good deal of business has resulted. In standard sections the local mills are doing almost nothing. Quotations are made: Rails, $21 to $23, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—Business which was expected to materialize in billets has failed to do so, and the tonnage closed last week was small, none in large lots. Rods are in good demand, but the local mills are full, or nearly so, and are not looking for business. Buyers have had to go to other markets to fill their wants in several instances lately. Quotations are made at $16.50 for billets and $23 for rods.

STRUCTURAL MATERIAL.—No large business has come up, but orders for small lots have been quite a little better than for a week or two past. Prices continue weak, and are a little lower than quoted last week. Quotations are as follows: Beams and channels, 1.70c; angles, 1.15c to 1.20c; plates, 1.20c to 1.25c; tees, 1.40c to 1.45c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Some business has been done. The local mills report a better inquiry and better chances for doing business in the future. Prices are made as follows: Tank steel, 1.20c to 1.25c; flange steel, 1.35c to 1.40c; fire-box, 2c to 5c.

SHEETS.—The market is very quiet, and almost no business is being done. Sales are limited to small lots except in a few instances, and are never very large. Jobbers report a fairly good inquiry for galvanized sheets from stock, however. Quotations are made at 2.05c to 2.10c for No. 27 black and 80 and 7½ per cent discount on galvanized.

MERCHANT STEEL.—Some improvement is noticeable, although it is slight. Orders continue to be small. The demand is getting a little better, and one or two inquiries for round lots of material have been received in the past week.

Prices are as follows: Open-hearth spring, tire and machinery steel, 1.75c to 1.85c; smooth finished machinery steel, 1.55c to 1.60c; smooth finished tire, 1.40c to 1.50c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—Very little business of any kind is being done. There is quite a wide difference in the views of buyers and sellers as to values, and the absence of actual wants of consumers shuts off any large trading. There are no changes in quotations, but those given are mostly nominal, and represent dealers' views as to selling values. Prices are made at $11.75 and $12.25 for old iron rails, $8.50 to $9 for old steel rails, and $10.25 to $10.75 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $12 to $12.50; dealer's forge, $10 to $10.50; No. 1 mill, $7 to $7.50; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $14.25; cast borings, $3; wrought turnings, $4; axle turnings, $5.50 to $6; mixed steel, heavy, $7.50; stove plates, $5.50; heavy melting steel, $8.50 to $9.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, April 28.

A check to the declining market on Bessemer is generally accepted as a better condition, and estimates on iron are higher but with no response other than a purely speculative purchase. Trades are reported between holders of iron and steel, but none with any bearing on current values. The New Orleans hotel is the principal structural contract taken, no letting of other work being made. Declining prices on angles and sheared plates continue current and are explained by the abnormal anxiety of mills for tonnage. Short time rules almost universally in all local mills, except the rail mill and the various wire plants.

PIG IRON.—While stagnation still rules, much of the uncertainty and consequent fear have passed with the week. An Eastern speculator, already a large holder of iron bought last fall, is said to have added 5,000 to 10,000 tons of valley iron to the stock already held, and a consuming interest is asking prices on 9,000 tons for third quarter delivery. These, with the blowing out of valley furnaces, have slightly bettered the feeling, but have altered actual conditions but slightly. Little is heard of $9 valley iron, in spite of open assurances that this figure is possible. Pittsburg iron has the call just now and is quoted from $9.75 to $9.90. A few small lots have been taken. Gray forge is uselessly quoted but is held at $8.65 to $8.90. Foundry irons are as dull as before and $9.75 has been done on No. 2. Quotations follow:

Bessemer	$ 9.75 to $ 9.90
No. 1 Foundry	10.25 to 10.50
No. 2 Foundry	9.90 to 10.15
No. 3 Foundry	9.00 to 9.50
Gray Forge	8.65 to 8.90

BILLETS.—Trades and exchanges of iron and billets have been carried on vigorously of late, but in none of them is any indication of a consuming demand. Billets quoted by Pittsburg mills at $14.65 to $14.75 would probably be delivered for that price and $14.50 is the basis of close mill figuring. The trading going on does not affect general conditions in the least.

STRUCTURAL MATERIAL.—The business of the week has been on the small order. The New Orleans contract of 500 tons for a hotel extension was closed, and the order comes to Pittsburg. The contract for the Millvale hospital and parochial

school was awarded L. Benz & Bros., local contractors, but the contract for the 1,000 tons of shapes is not yet awarded. The Montreal bridge work is now being settled. Competition continues to tell on mill quotations and angles are reported sold as low as 90c under vigorous hammering. Current quotations are as follows: Beams and channels, 15-inch and under, 1.55c; 20-inch, 1.70c; 24-inch, 1.75c; angles, 1.c to 1.05c; universal plates, 1.05c to 1.10c; zees, 1.30c to 1.35c; tees, 1.35c to 1.40c.

Merchant Steel.—Except in one or two lines, buying of merchant steel continues very limited. Quotations are made as follows: Soft steel bars, 1.20c; spring, 1.30c to 1.35c; open-hearth spring, 1.50c to 1.55c; machine straightened tire, 1.25c to 1.35c; toe calk, 1.40c to 1.50c; machinery steel, 1.30c to 1.35c, base; sleigh shoe, 1.30c to 1.35c. Tool steel, common, 5c to 7c; special brands, 10c and upwards.

Plates.—Even the smaller plate orders are closely followed, and the struggle for tonnage is producing some low figures. Mills are asking 1c to 1.05c, but business has been taken at .90c and .95c. Open-hearth material has not suffered to any such extent as Bessemer, and fair tonnages of the better grades are selling. Mills are quoting as follows: Tank, Bessemer, 1.05c to 1.07½c; open-hearth, 1.10c to 1.15c; shell, 1.20c to 1.30c; flange, 1.35c to 1.40c.

Pipe and Tubes.—The business going is small lots of merchant pipe, and prices remain very low. Quotations on merchant pipe are as follows: Merchant pipe, 57 to 67 per cent; galvanized, 50 to 55 per cent; on car load lots, six tens; less than car load lots, five tens and five per cent. On attractive business six tens and five per cent has been made. Quotations on merchant boiler tubes are as follows: Two and a quarter inches and smaller, 70 and 10 per cent discount; two and a half inches and over, 75 and 5 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

Bars.—Business in bar iron is largely the established trade in special brands. Pittsburg mills cannot meet valley quotations and the business available goes to lower bidders. Muck bar at $18.25 to $18.50 is likewise inactive. Steel bars are moving actively but at figures likely to keep out of the market all mills not in need of tonnage. Less than 1c has been quoted on bar iron. Pittsburg quotations are 1.15c for common and 1.25c and upwards for special brands.

Sheets.—Both black and galvanized sheets are in better shape. Orders are of good size and are more numerous. Only a slight improvement is noted in prices which are quoted: No. 26, 1.90c; No. 27, 2c to 2.05c; No. 28, 2.10c to 2.15c. Galvanized are quoted 80 and 5 per cent off list.

Iron and Steel Skelp.—We quote: Grooved steel skelp, 95c to 1c; sheared, 1.05c to 1.07½c; grooved iron skelp, 1.12½c to 1.15c; sheared iron skelp, 1.25c to 1.30c.

Railroad and Track Supplies.—Specifications on rail contracts are not coming in rapidly and a slight reaction is noted in track material. Rails are nominally at $20. Other quotations are as follows: Splice bars, 1.30c to 1.35c; track bolts, iron, 1.95c to 2c; steel spikes, 1.65c to 1.75c.

Old Material.—Sales now being made in scrap are largely in order to realize. Stocks of this sort are being offered much below current quotations and are not easily disposed of then. No. 1 wrought scrap has been offered of late at $10.50 and mixed lengths of steel rails can be had for $9.50 to $9.75. Other quotations depend on conditions of buyer and seller.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Buffalo. The pig iron market is absolutely devoid of interest; very little is doing and the market is without life. With one exception, we have not heard of any transactions exceeding 500 tons during the past two weeks. This one was for a lot outside of the usual channels, which was forced to sale, and at a price the lowest yet recorded. The market is nominal at the following figures, which are on the cash basis f.o.b. cars at Buffalo: No. 1 strong foundry, $11.50; No. 2, $11; Ohio strong softener, No. 1, $11.50; No. 2, $11; Jackson County silvery, No. 1, $14; Southern soft, No. 1, $11; No. 2, $10.75.

Cincinnati. Most of the business in foundry irons at present is covered by small contracts for early delivery. Orders ranging from car loads to 100 tons are frequent. A few transactions of importance have taken place during the past week, but the so called current prices have been badly cut and quotations are decidedly irregular. A number of the furnaces are adhering strictly to prices that they say are the lowest that will be accepted, but there are still enough anxious sellers to keep the market badly demoralized. The latest reports from the South show that the furnaces now in operation do not intend to stop unless matters get decidedly worse. It is not thought that stocks are increasing during this month. The active furnaces in Alabama are eight stacks of the Tennessee C. I. & R. R. Co., two Sloss, two Woodward, one Woodstock and two at Sheffield. Some foreign shipments are still going forward, and the Birmingham situation is thereby relieved. There is promise of relief in the North on account of the proposed action of several furnace companies who intend to blow out unless unlooked for improvement occurs soon. The reports from salesmen working in all the iron consuming districts of the country show that there is little, if any, increase in consumption, by either foundries or rolling mills. The quotations below have been shaded in recent transactions, though some furnaces hold to them: Southern coke, No. 1 foundry, $9.50 to $9.75; No. 2, $9 to $9.25; No. 3, $8.75 to $9; gray forge, $8.50 to $8.75; mottled, $8.50 to $8.75; No. 1 soft, $9.25 to $9.50; No. 2, $9.00 to $9.25; Hanging Rock charcoal, No. 1, $14.75 to $15.75; Tennessee charcoal, No. 1, $12.75 to $13.75; Jackson Co. silvery, No. 1, $12 25 to $12.75; standard Georgia car wheel, $14 50 to $15.25; Tennessee car wheel, $13.25 to $14.25.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The April meeting of the Pittsburg Foundrymen's Association was held Monday evening, April 26, at the association rooms in the Builders' Exchange, the president, Robert Taylor, in the chair. The following persons were present: Robert Taylor, H. M. Wilson and Wm. Mobberly, Taylor, Wilson & Co.; Secretary F. H. Zimmers, Union Foundry & Machine Co.; Jos. S. Seaman and Robt. Sleeth, Seaman-Sleeth Co.; William Yagle, Wm. Yagle & Co.; Phillip Mathes, Brittain, Graham & Mathes; David L. Evans, Rosedale Foundry Co.; Jas. McDonald and Jas. Boyle, Westinghouse Electric Mfg. Co.; S. M. Rogers, Hainsworth Steel Co.; John A. Logan, Jones & Laughlins, Ltd.; Richard G. G. Moldenke, McConway-Torley Co.; W. B. Sterritt and D. J. Thomas, Sterritt & Thomas; A. H. Woods, Roessing & Co.; C. Wike, Hall Steam Pump Co.; John R. Gilmore; G. M. Greene; R. F. Barker, Pittsburg Mfg. Co.; Jas. R. Mills, Jr., *The Iron Trade Review*; Mr. Myers, *American Manufacturer*; S. B. Robbinson, Monongahela Mfg. Co., Monongahela City, Pa.; Elias A. Kebler, Matthew Addy & Co.; Benjamin Fuller.

A committee, consisting of Messrs. Robinson, Yagle and Mathes, was appointed by the chair to secure rates and have in charge all arrangements for the trip to the Detroit convention of the American Foundrymen's Association.

The regular order of the meeting was a paper by Richard G. G. Moldenke, Ph. D., of the McConway-Torley Co., on "Recent Progress in the Gray Iron Foundry." The paper appears elsewhere in this issue.

Discussion followed the reading, and it was finally decided to refer the paper to a special committee of five practical founders who should make special study and be prepared to lead a more exhaustive discussion at the May meeting. President Taylor appointed as this committee Messrs. Fuller, Mobberly, Sleeth, Gilmore and Barker.

After transacting routine business, and extending a hearty vote of thanks to Dr. Moldenke, the association adjourned.

Case Library, of Cleveland, has been making a collection recently of trade catalogues and announcements, particularly in mechanical lines. Illustrated descriptions of machinery in various lines of manufacture have been secured from firms in the United States, and also from some manufacturers on the other side. The idea of Librarian Orr is that many important devices and inventions are described in these publications, that would not be referred to except generally in any mechanical books of reference. The collection is a large and creditable one.

THE IRON TRADE REVIEW

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COSTS AND MARKET PRICES.

It is not surprising that buyers of iron and steel hesitate in the midst of events such as have made up the market history of the past year. One disturbance has followed upon another until the closest student of the situation is uncertain as to his bearings. The objectors to pools and combinations of any description may point to the present situation as a natural outcome of efforts to maintain prices by interposing between supply and demand. And certainly the repeated shocks the market has sustained in the tumbling of nail, billet, rail, bar iron and iron ore prices would be reason enough for such an unsettled condition as is found to-day. Buyers of steel bars, for example, are not entirely satisfied that if bars sold at 1c a pound when billets were $20.25, Pittsburg, there should not be a reduction from 1c when billets are $14.25 to $14.50, Pittsburg. The fact that bars were out of relation to the pool price while the pool lasted, is appreciated, but it is not surprising that a falling off of $5.75 in the raw material should disturb the buyer of the finished product and cause him to buy sparingly. Similarly buyers of Bessemer pig iron have been looking for reductions in that product, in view of a 35 per cent reduction in Bessemer ores. Here again the fact is recognized that Bessemer iron and Bessemer ore have been out of proper relation throughout 1896 and thus far in 1897, yet the old-fashioned rule that products vary in price as their components vary is still so lodged in the general thinking that buyers of Bessemer pig wait for reductions, while admitting that the price has been for some time in accord with the new ore basis.

One thing in particular has been emphasized, however, in all the upheavals of the past five months, and that is that demand is the final price arbiter. Costs of material may modify but do not determine prices when demand lags far behind supply. The manufacturer who continues to make sales may have to go below his cost line, and that is what sundry furnace and rolling mill firms have been doing of late. Furthermore, now that the survival of the fittest is the shibboleth, we may expect to see further sales at a loss before some concerns shall become satisfied that the market will not swing again to a point at which they can make money.

SOME BUSINESS INDICATIONS.

The *American Machinist* quotes the opinion of one well informed on the course of the machine tool trade, that the business so far this year is better than that of the first part of 1896, if bicycle-making machinery be left out of the account. The point is that standard machinery for ordinary purposes is in better demand now. The same paper quotes a recent remark of President McKinley that has not been published elsewhere, so far as we know. Speaking of the large number of persons who were pressing their claims for office, he said: "The way I want to help all these people is not by giving them Government positions. Just let the tariff bill get through and out of the way, and they will be finding employment before they know it and will not need to come to me." Not a few business men share the belief of the President that the settlement of the tariff schedules will do much to cure the hesitation that is emphasized in so many ways. But it is not to be overlooked that the tendency to hang everything on a single peg is likely to bring disappointment here also. The statement by Chairman Dingley that a year's imports have come in thus far in 1897, in some lines in which duties are to be raised, will help to account for any failure of the new tariff to set idle men at work.

Meantime, the passing phases of the situation will be reported according to the experience of the individual whose opinion is sought. Some favorable features are found in the general business situation, which must not be forgotten in their bearing on the iron trade. Railroad earnings continue to show gain over 1896, both net and gross. For February, the *Financial Chronicle's* statement of net earnings of 131 railroads shows a gain of 9.55 per cent over the preceding year. A feature not quite so satisfactory from some standpoints is that the net gain was almost entirely through reduction of operating expenses. But it is encouraging to note that as the 1896 gain in February was over $2,000,000 from the corresponding month in 1895, railroad operations to-day — with all that is yet to be desired, in larger traffic and greater certainty as to the stability of rates — are very distinctly ahead of the early portion of the year that brought a boom to the iron trade. There is an increase of late in west-bound traffic, due to an improvement in the jobbing trade in the West, this change for the better being reported from several centers. The impression of betterment has reached to Eastern money circles. While banking institutions are making low interest on loans, they find signs of a better feeling in the country, that, with fair crops and reasonable expedition in disposing of the tariff, should grow into confidence.

The imports of merchandise to the United States in March exceeded exports by $10,898,700, being $87,271,531. For the nine months ending March 31, the exports were $822,269,744 and imports $498,888,-

225, making the excess of exports the enormous sum of $323,381,519. In the nine months ending March 31, 1896, the exports were but $678,241,057 and the excess of exports but $70,590,561. It is surprising, in view of the increase of imports in anticipation of the new tariff, that the favorable balance has been so well maintained. Furthermore, if any effect is felt here of the uncertainty and conflict in Europe, it will be favorable. A greater demand for American cereals and other foods, as well as war material, is to be expected. As the situation is, the call for our cereals has been steady, and the home wheat market has been firmer.

While foreign investors will not be in a hurry to go largely into American enterprises, it goes without saying that any increase in foreign complications will mean a corresponding improvement in the standing of this country as a safe place to put money.

We do not overlook the fact that the considerations presented above are in a measure offset by others, chief of which are the uncured defects in our financial system; but the favorable indications should not be overlooked in hasty generalizations that just now are apt to savor too strongly of the pessimistic.

PRODUCERS of Bessemer pig iron in the Mahoning and Shenango valleys take exception, and with apparent reason, to the longer maintenance of Pittsburg as the reckoning point for the price of their product. They admit that the developments of the past year have practically eliminated Pittsburg as a market for valley iron. The leading producer there, once a large buyer of iron, has been out of the market for a year and is not likely again to be a customer of valley furnaces. Such Bessemer iron as other steel producers in the Pittsburg district may need, the merchant furnaces in that district will doubtless be able to supply, as they have done in the past year. Indeed, it is not beyond probability that the interest that has been the chief consumer of valley iron heretofore may, at intervals, be a seller of Bessemer pig. At all events, valley furnacemen recognize that their natural market is the steel plants in the valley and those at other points which may be reached under favoring freights. Pittsburg being no longer a delivery point, it is argued that it can no longer have more than a sentimental influence upon prices of valley iron. Recently a sale of Pittsburg iron was made at $9.50 for prompt delivery, and the valley market, according to buyers' ideas, at once became $8.85, though no valley iron was offered at such a price. The speculative features of the Pittsburg market have long been a thorn to valley producers and now that events have cut them loose from that center they naturally object to having Pittsburg influences exerted in the making of their prices. The tendency to make Pittsburg the base of computation would have much less reason to appear in the market for foundry iron, because Pittsburg foundries have been very small buyers of valley iron; yet instances are cited in which buyers in Eastern territory have deducted the 65-cent freight from Pittsburg prices on foundry grades, to establish a basis of reckoning on valley purchases. It is not to be wondered at, in view of the strained conditions that have prevailed of late, and the general wiping out of margins, that sellers should except to any practice tending still further to depress the market.

THE Canadian duty on pig iron has been reduced from $4 to $2.50 a ton, and the bounty to Canadian furnaces has been increased to $3. The reduction of the duty will doubtless result in larger sales of iron from this side the border, particularly of such irons as are not now produced in the Dominion.

Concerning the First Use of Lake Superior Ores.

TO THE EDITOR:

I submit the following as a part of the history of the first use of Lake Superior iron ore:

In 1850, I was a promoter of the Sharon Iron Co., and furnished the plans for the construction of the works at Sharon, Mercer Co., Pa. In 1852, the Sharon Iron Co. bought the controlling interest in the Jackson Iron Co., of Lake Superior, and brought down to the port of Erie, Pa., what was then considered to be the first cargo of Lake Superior iron ore. The ore was shipped to Sharpsville, and was there smelted into pig metal by the late David Agnew. The pig metal so made was taken to Sharon and there puddled in my presence. I left Sharon at the close of 1852, and went to Pittsburg to construct the Clinton rail mill for the manufacture of rails for the Cleveland, Columbus & Cincinnati Railroad. In 1855, while in Cleveland, I saw a large pile of iron ore and upon inquiry learned that it belonged to the Cleveland Iron Mining Co. Upon going to the office of the company, I met W. J. Gordon, the president, S. L. Mather, the treasurer, and H. B. Tuttle, the secretary, and was informed that the ore was the first cargo of Lake Superior iron ore that had arrived in Cleveland from Lake Superior. I bought the entire cargo (which, I think, was 500 tons) and shipped it to Pittsburg via C. & P. R. R. to Wellsville, and by boat from there up. I introduced the use of the ore in Pittsburg as a fix for lining the metal chamber of puddling furnaces. I think these were the first two cargoes of Lake Superior iron ore which came down, and that my esteemed friend, the late A. L. Crawford, of New Castle, got 10 tons from our cargo at Erie.

JACOB REESE.

400 Chestnut street, Philadelphia.

Personal.

Tod Ford, president of the Youngstown Steel Co., Youngstown, O., has returned from a sojourn in the Bermudas.

W. R. Warner, of Warner & Swasey, president of the American Society of Mechanical Engineers, is the new president of the Cleveland Board of Trade.

Geo. A. Newett, editor of *Iron Ore*, Ishpeming, Mich., who has been highly efficient as commissioner of mineral statistics for Michigan, in the past two years, has been reappointed by Governor Pingree.

Received from the Trade.

The Jeffrey Mfg. Co., of Columbus, O., has just issued its 1897 catalogue descriptive of chains and labor-saving appliances. It is handsome mechanically and is one of the most complete of its kind. The first part is devoted to illustrations of the labor-saving devices as applied to various industries, and the balance is devoted to illustrating the company's chains, sprocket wheels, cable conveyor fixtures, and general mill and factory supplies. Copies can be had by addressing the company at Columbus, New York, Chicago, Philadelphia, Buffalo, St. Louis, and Denver.

DIETZ, SCHUMACHER & BOYE, of Cincinnati, the well-known builders of machine tools, will erect a new two-story machine tool building the coming season. They have purchased a lot on the corner of Queen City avenue and Buck street, and work will begin as soon as possible, plans and specifications having been approved. The new building will be 180 x 90 feet and will be modern in all respects.

SOME POINTS IN CUPOLA PRACTICE.

At the March meeting of the New England Foundrymen's Association at Boston, W. W. Bird, of the Broadway Iron Foundry, Cambridgeport, Mass., read the following paper on questions relating to tuyere area, blast pressure and temperature, in connection with the melting of iron in the cupola:

To obtain the best results in melting iron, what should be the percentage of tuyere area of the furnace? What is the proper pressure to the blast, and what are the effects of too little or too much tuyere area or blast pressure?

In reading the numerous circulars with regard to patent furnaces, center blast, etc., one is apt to be confused with regard to what it is possible to do in the line of melting iron, and to think that something must be wrong either in one's methods or else in the other party's claims. Therefore before taking up the discussion of this topic, it will be well to first consider the theoretical possibilities, as the best results certainly cannot be better than these.

The efficiency of melting, like the efficiency of a boiler, depends largely on the condition of waste gases; for aside from radiation, the only loss of heat after furnace reaches normal temperature is in what goes off in this way. The cause of this loss may be divided into three parts: 1. Incomplete combustion or carbonic oxide in gases. 2. Excessive temperature of gases. 3. Too much air.

The following table shows the number of pounds of iron possible to melt with one pound of ordinary coke under the various conditions indicated. In making out this table no account is taken of the heat required to raise the temperature of the brick work or of the heat lost by radiation and conduction, nor of heat supplied by kindling wood in bed. As these quantities would be about the same, the relative values would remain practically the same if these quantities had been considered.

The calculations are based on the following data. The temperature of iron is taken at 50 degrees at beginning, 2,600 degrees at melting point and 2,900 degrees as it leaves furnace. The specific heat of iron .13 latent heat 233 heat units. This gives 603.5 as number of heat units required to raise the temperature of one pound of common cast iron from 50 degrees to point of fusion, and then 300 degrees higher after melting it. Experiments have shown that iron which would be considered fairly hot is at a temperature of about 2,900 degrees as it is run into a ladle. The number of heat units per pound of coke is taken at 13,000; the temperature of air 50 degrees and specific heat .237 and 12 pounds as necessary for the combustion of one pound of coke; the specific heat of coke .21.

Pounds of Iron per Pound of Coke.

Temperature of Gases at door.		400°	800°	1200°	1600°	2000°	2400°
Complete Combustion		19.8	17.8	15.8	13.8	11.8	9.8
Percentage of Coke or Carbonic Oxide.....	10	18.4	16.5	14.6	12.7	10.8	8.9
	20	17	15.2	13.4	11.6	9.8	8
	30	15.6	13.9	12.2	10.5	8	7.1
	40	14.2	12.6	11	9.4	7.8	6.2
Percentage Air Excess.....	5	9.7	17.6	15.5	13.4	11.3	9.3
	10	19.6	17.4	15.2	13	10.8	8.6
	15	19.5	17.2	14.9	12.6	10.3	8
	20	19.4	17	14.6	12.2	9.8	7.4

It will be seen from this table that the ratio of melting decreases at the rate of one pound per 200 degrees increase in temperature of gases with complete combustion; that the ratio decreases more rapidly the greater the excess of air, while with incomplete combustion or lack of air the ratio decreases less rapidly the greater the percentage of carbonic oxide; that better results are obtained by having too much air than by not having enough, but that this difference is less as the temperature of the gases increases, remembering that 10 per cent C O is the same as 5 per cent lack of air; that the best results, whether with too little, too much or just the right amount of air, are obtained with the lower temperature.

The best results are to be obtainable, therefore, by having air enough and getting low temperatures at charging door, and is accomplished to a certain extent by having the door as high as possible, so that the gases in passing up from melting point will have a chance to heat up the subsequent charges before escaping. There is generally a loss, however, by the hot gases passing through the fuel of next charge and giving oxygen to the fuel carbon to form carbonic oxide which will burn later when it gets air.

After the charges are all in, the temperatures of the gases increase as the last charge settles, while in the first of heat a considerable amount of heat is required to warm up the furnace itself, relatively greater the smaller the furnace, so the last results are probably obtained in the middle of heat.

Taking the ratio for ordinary practice in melting as 8, the amount of air required is 1½ pounds per pound of iron, or 16 to 18; a foot of air must be put in for each pound of iron.

Let Q be the number of cubic feet of air required, then Q equals A V T — where A is "area" of opening, V the "velocity" of flow, and T the "time." The relation between T and Q depends on rate of melting, so that the necessary amount can be obtained by making area larger or smaller, according to charge in velocity, which depends on pressure. Assuming the rate of melting, which must necessarily be limited by area of furnace, the amount of air needed can be found.

The real resistance to the flow of air is in the furnace opposite tuyeres rather than in the tuyeres themselves, as is shown by the blast gauge, which will vary during the heat due to the settling of bed while the revolutions of blower and tuyere openings remain the same, also in difference of blast between coke and coal.

It is desirable to carry pressure enough to get the air into center of furnace and well distributed through the fuel. Too much blast will carry fire higher and consequently give hotter escape gases, beside burning out the lining more rapidly. But it must be remembered that while the blast gauge may show 8 or 10 ounces of pressure, it does not follow that the air is going in—that is, with a centrifugal blower—however much the flow of air is decreased, so that it is well to know the pressure with all the tuyeres closed and then open them, so that the pressure is a little less. It is then certain that the air is going in to the capacity of blower.

An eight-ounce pressure seems to be sufficient for furnaces under four feet in diameter, with increase of pressure for larger sizes. The ratio between tuyere and furnace ranges from 1 to 4 to 1 to 20 in the various furnaces in use. The larger the tuyere area the more air up to the point where flow of air is limited by fuel in cross section of furnace itself, and consequently the more rapid the melting; but different furnaces, having same ratio and blast, will not give same results, as no two melters will have same iron and fuel nor put it in the same way, so that the same pressure outside may give more or less in one case than in the other. Too rapid melting is apt to give slacker iron, but this of course can be changed by varying charges.

The conclusion is that furnaces melting 8 to 10 must have about the right proportions for method of charging used, that those requiring fuel 6 to 1 need looking after, and that those claiming 15 to 20 to 1 need watching.

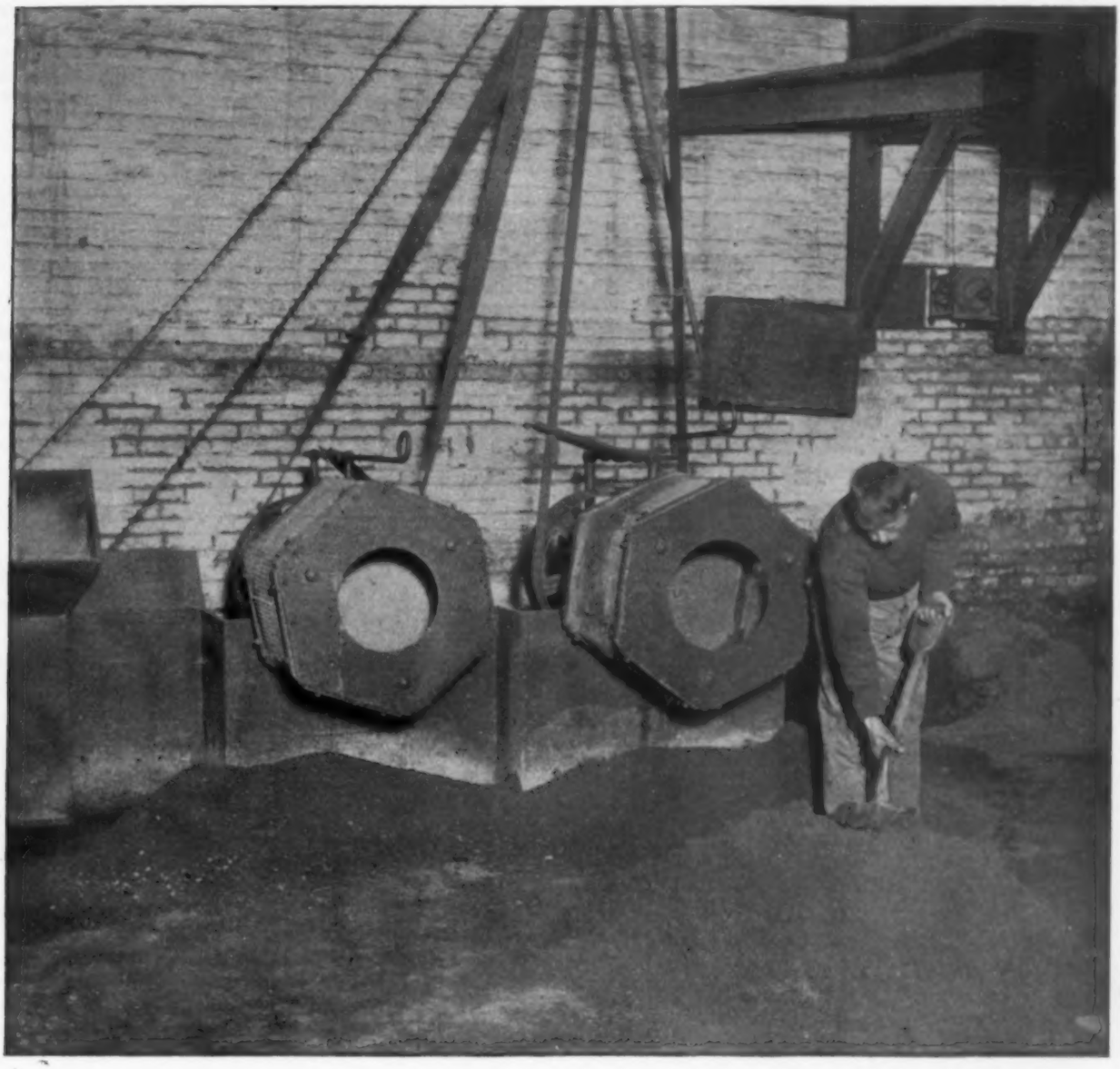
A Well-Equipped Machine Shop.

Equipment has been about completed of the new plant of the Bair & Gazzam Mfg. Co., machinists, of Pittsburg. The machinery installed and the structure itself are worthy of special note as a marked advance over the general run of machine shops. The building, which is at the corner of Ferry street and Third avenue, is 80 x 57 feet and is practically seven stories high, the large and well-lighted basement containing, in addition to the two 20-h. p. gas engines which furnish power for the entire building, large planers and other heavy machines. The building is entirely fireproof, is provided with both passenger and freight elevators, and is heated throughout by steam. The equipment is the best to be had and includes some new and specially valuable machines. Noteworthy among these are: a special flat turret lathe, manufactured by the Jones & Lampson Machine Co.; a special screw cutting lathe made by the Putnam Machine Co., and capable of cutting screws up to a 12-inch pitch, and a universal grinding machine of a special type. In addition to the new patterns of machinery are an ordinary 27-foot lathe and a 12-foot planer. The output of the plant is punch and die work, special tools, gear and rack cutting and milling, experimental and general machine work. The company occupy five of the seven stories, the other two being sublet.

An Anderson, Ind., dispatch says that the site of the new plant to be erected by the National Tin Plate Co. in the Pittsburg district has been fixed, and that a tract of farm land on the Monongahela River 29 miles from Pittsburg has been purchased. The contracts for the buildings and equipment were let some time ago, as noted in these columns at the time.

SAND SIFTER AND MIXER.

Sand sifting by an oscillating basket sieve set up in suitable framework, and sand mixing by means of a machine utilizing the centrifugal principle, are examples of recent progress toward the easy performance of one of the most laborious and monotonous tasks of the foundry. The illustration presents another type of machine for the ready preparation of sand for molds and cores. There is nothing complicated in the mechanism. The reciprocating motion of some devices is avoided and the whole contrivance is so simple as to suggest that it must have been long in use. A box with hexagonal ends and its periphery of wire of proper mesh, is the receptacle. Motion is secured by means of a horizontal shaft mounted on two standards with tight and loose pulleys be-



tween, the sifter being on the outer end of the shaft. The sand is shoveled into the end opening shown. Ribs within lift and agitate the sand, with the revolutions of the sieve.

The two sieves shown are arranged to sift coarse and fine respectively. The netting on the left hand sieve is ½-inch mesh and that on the right hand is ¼-inch. The finer sieve is used as a dry sifter and mixer, and the coarser one as a mixer after the material is wet down. After the sifting and mixing is all completed the sand is conveyed automatically to the upper floors by the conveyor at the left. In this case a 250-volt dynamo of one h. p. drives the two sieves and the conveyor. The sifters are made by Gould & Eberhardt, Newark, N. J.

The Gilbert Pulley Does not Infringe.

The has been considerable friction among manufacturers of wood-split pulleys, caused by the claim made by one firm that its patent covered the manufacture of pulleys so completely that all other makes were infringements. Various suits and cross-suits have been brought, and a great deal of advertising literature has been circulated regarding these suits and their outcome. A decision has been given at Cincinnati, that the Gilbert wood split pulley, made by the Saginaw Mfg. Co., of Saginaw, Mich., does not infringe upon the Dodge patents. The Saginaw Company makes the claim that no decision has been made by any court that the Gilbert pulley in any way is an infringement upon the Dodge patent. It also states that it will defend any suits which may be brought on account of the use or sale of its pulley, paying all costs of same and all final judgments, if any, that may be rendered.

The Saginaw Company has just appointed one of the most energetic and reliable concerns in Chicago, the W. A. Jones Foundry & Machine Co., 53-59 South Jefferson street, its agent for that city. The latter company has added to its large stock of power transmitting machinery a complete stock of Gilbert wood-split pulleys, comprising all sizes from 3 inches to 60 inches in diameter. The company is prepared to fill, from Chicago stock, orders of any size for the pulleys, and agrees to furnish a bonded security for any costs or damages that might in any way come from the use or sale of the Gilbert pulley.

THE Lalance & Grosjean Mfg. Co.'s Harrisburg, Pa., reports much activity in its tin plate plant. Four mills are now operated by three crews on each mill, and this week a fifth mill started. The output at present exceeds by 25 per cent any rate of production attained heretofore and it is calculated the present output will double itself in the near future. The product is sheet steel and tin and terne plates.

LAKE SUPERIOR IRON MINES.

The Swanzey mine of the Escanaba River Land & Iron Co., located on the Marquette range, is advertised to be sold this week at receiver's sale. A sale was negotiated two years ago at $85,000, but the stockholders refused to agree to it. It is stated on the basis of operations thus far that two-thirds of the ore in sight is Bessemer. The stockholders are averse to a sale in the present condition of the ore market, but Receiver T. M. Wells, of Negaunee, has paid out $24,000 in the past four years, and must realize on the property.

A 90-ton Vulcan shovel has been shipped recently to the Oliver Mining Co., for use at the Mountain Iron mine. The shovel is similar to two sold the same company last year and in use at the Oliver mine, except that it is built stronger in many particulars. The frame is constructed of six 15-inch I beams, 36 feet long, each of which will weigh about 2,200 lbs. The balance of the shovel is constructed in proportion. The hoisting power is a pair of 13 x 15-inch engines, with 10-inch hoisting piston and 60-inch gear. The hoisting chain is 1 ⅜-inch best quality of dredge chain. The swinging is accomplished by an independent pair of 7 x 9-inch engines. The swinging chain is 1¼ inches. The dipper is handled by an independent pair of 7 x 9-inch engines with two pinions 6-inch face working into a similar rack on the dipper stick. The axles are 6 inches in diameter, the journals of which are 5 x 8 inches. The shovel is guaranteed to put three dippers full of ore a minute on to a car. The dipper is of 2½ yards capacity.

The shutting down of the Sellers mine at Hibbing, which had employed 85 men, is taken as an indication of the course of several Mesabi properties, in view of the extreme low prices of the present season. There is no official announcement as to the purpose of the company, which is largely controlled by a Pittsburg steel interest, but it is claimed that ore can be more cheaply bought than mined on to-day's basis. The mine has 50,000 tons on stockpiles. The pumps will be operated during the shutdown.

The operation of the Biwabik mine by the Biwabik-Bessemer Co. this year is still under advisement. No preparations have been made as yet for resuming operations.

S. Dessau, of the Dessau Mining Co., has secured an option on the Harlow property near Quinnesec, Mich. Two samples of ore have shown Bessemer of good quality, but the question of quantity is to be determined before a shaft is sunk.

From the Menominee range shipments to Escanaba docks have been made this month by the Chapin, Cundy, Dunn, Columbia, Badger, Dunn and Crystal Falls mines.

At the Queen mine at Negaunee, operations are on in full after a brief shut-down and the output of from 1,000 to 1,200 tons a day is being forwarded to Escanaba. The expectation is that this property and the Blue, which is under the same management, will be fully operated this season, in view of the necessity of attaining the minimum of cost.

At the Lake Angeline mine the third level openings are being vigorously pushed, and the task of preparing for the electric motors will soon be commenced. There will be more room here than on the level above, the tracks will have better curves, and there will be improvement in the ore-handling that will be valuable. The electric motor is certainly a great success at the Lake Angeline, and the mine is one of the neatest to be seen in the Lake Superior region.—[Ishpeming Iron Ore.

At Duluth, the Colonial Mining Co. has filed articles of incorporation, bearing the names of Harry Roberts, William White and C. E. Shannon. The name of John H. Bartow, of Cleveland, is also mentioned in connection with the enterprise. The property that will probably be operated is adjoining the Canton mine, and a Duluth report states that arrangements have been made for the use of the south shaft of the Canton for a working shaft.

The change in the condition of the ore trade must soon result in a radical reduction of royalties on the Mesabi and Vermilion ranges if producers are to successfully compete with the mines on the Minnesota and Wisconsin ranges. Owners of iron mines on the Mesabi and Vermilion are receiving a royalty of from 20 to 30 cents a ton, the State receiving 25 cents for ore taken from State lands. Lately leases of good mines have been offered for considerably less than 20 cents with no takers. On the old ranges royalties are based on a percentage of the market value of the ore at Cleveland, the rate paid by the Norrie, which is the ore used as a basis for determining ore values, being six per cent. This season the Norrie is worth but $2.65 at Cleveland, which makes the royalty a trifle less than 16 cents a ton. There is a differential in favor of Norrie ore as compared with standard Mesabi ore of 25 cents a ton, so it will be seen that the Norrie royalty of 16 cents is the equivalent of only between 10 and 15 cents a ton for Mesabi. The average royalties paid on Michigan and Wisconsin ranges is six per cent of the price of ore at Cleveland, which this year will make them run from 15 to 20 cents. On that basis Mesabi royalties would be worth from 10 to 15 cents. It is probable that future leases on Minnesota ranges will be made on a percentage of the valuation of the output, and eventually the ruling rate will probably not be in excess of four per cent and perhaps as low as three. It will require but a year or two of idleness of independent properties to bring their owners to a realization of the import of changed conditions, when they will be glad in order to make their holdings productive, to give leases on a basis that will insure the operation of their mines.—[Iron Ore.

THE TIN PLATE MARKET.

The meeting of members of the new tin plate association at Columbus, Friday, April 23, was given up largely to the discussion of the drawback provision of the new tin plate tariff and to questions pertaining to the wage adjustment that will come with the middle of the year. The report of the committee on the tariff was presented and the result of the conference with the Standard Oil Co. on the drawback provision was discussed. The agreement among the mills restricting quotations to deliveries prior to July was discontinued and the prices now ruling are quoted for deliveries throughout the year. Within the week the stagnation in the market has continued. Practically no new business is being done. We continue quotations:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$4.05	$4.80
Calland Grade,	4.25	5.00

COKE TINS.

Full weight, basis weight,	$3.45
100 lb. " "	3.35
95 lb. " "	3.30
90 lb. " "	3.25
85 lb. " "	3.22½
80 lb. " "	3.20

TERNES.

Full weight,	14 x 20	$3.45
	20 x 28	6.90
100 lb.,	14 x 20	3.35
	20 x 28	6.70

New York dealers are offering roofing plates at less than the $6.70 basis for double box and coke tins below $3.35.

A New Form of Grate Bar.

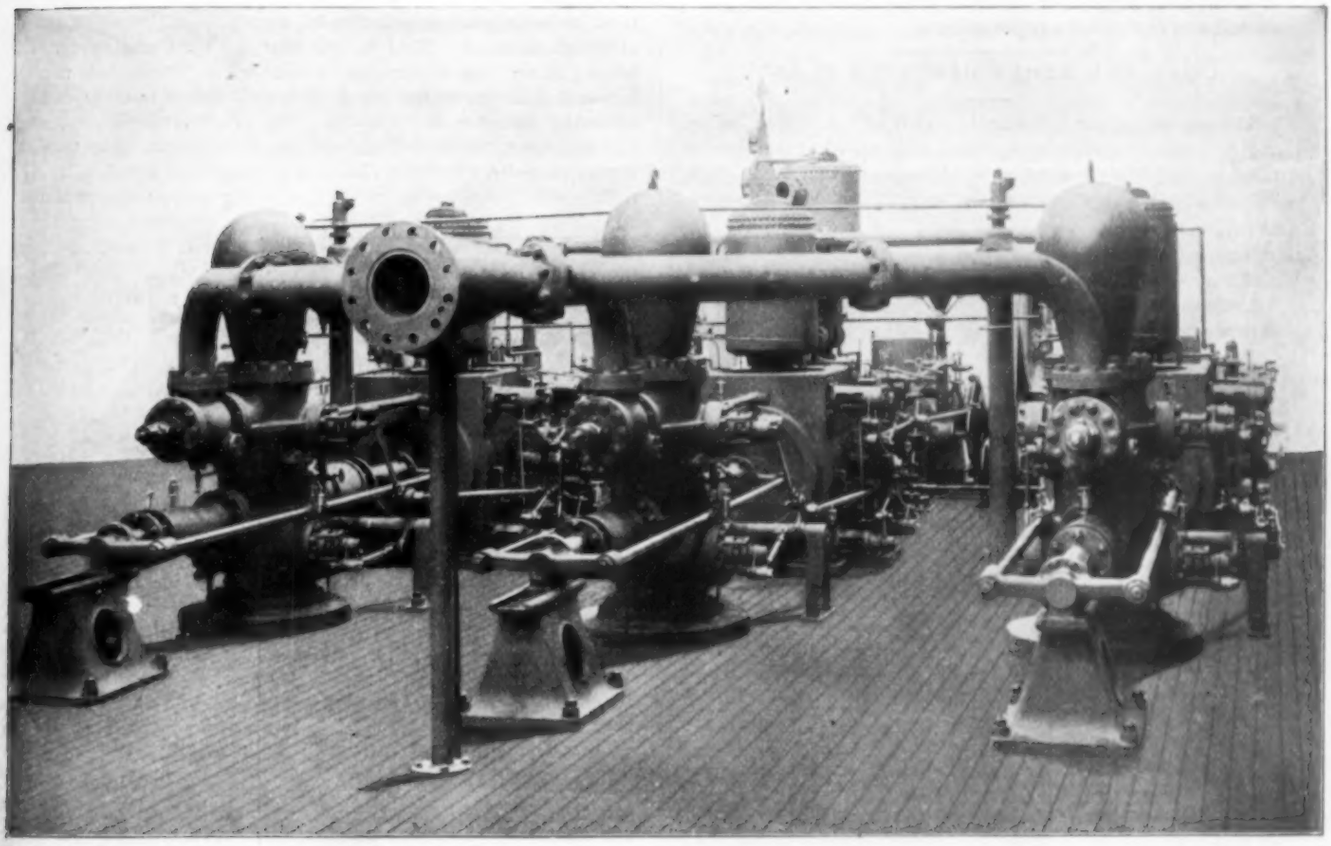
The Playford Stoker Co., of Cleveland, has recently been granted a patent on a furnace grate bar. The bar consists of a wrought iron T iron, which takes the place of the web of an ordinary grate bar, and upon which are strung wrought iron or cast iron sections of desired width, mortised on the under side to slip easily on the T iron. It is claimed for this construction that the sections, by reason of their size and shape, will not warp from the effects of expansion and contraction, are practicably unbreakable, if made of wrought iron, and can be made at a cost much less than the ordinary bar. Bars may be made of any desired width, by simply adding sections to the T iron. Between the sections are spacers which protect the T iron from coming in contact with the fire and at the same time regulate the admission of air. It is also possible, with this construction, to remove any sections that may have been subjected to harder service than others, without discarding the whole bar.

FIRE, last week, destroyed about 50 of the houses built within the Homestead Steel Works during the strike several years ago. The settlement was called "Pottersville," after Supt. John A. Potter. The buildings have been occupied by foreign laborers ever since.

THE NEW CHAPIN MINE PUMP.

At the time the contract was let, brief data were given in these columns concerning the new Riedler pumping engine built by Fraser & Chalmers, of Chicago, for the Chapin Mining Co. The plant has now been installed in the Hamilton shaft—which has been connected with the Chapin by the work of the past year—and its operation is in every way successful. The pump is 1,325 feet below the surface, in a room 60 x 30 feet, and is the most powerful yet built to go under ground. The type is triplex horizontal tandem compound condensing Corliss, and it is possible to employ one, two or three pumps, as desired.

There are two condensers directly operated by the main engine, either one of which, in case of emergency, is large enough to handle the steam from the engine when running at maximum duty, so that in case of an accident the pump would not be entirely shut down. The pumps were tested with valves at air chambers in place and to pressure of 1,100 pounds per square inch, this being 50 per cent in excess of the working pressure. The pump bodies are made of special iron that stood a pull of 30,000 pounds. The discharge air chambers



are made of welded flange steel, and, consequently, there will be no difficulty in retaining air in them.

The design represents the most compact type of differential pump yet built. The noteworthy thing about it is the reduced proportion of pump castings as compared with ordinary mine pumps of large capacity. The single, positively closed valve is a prime factor in securing this economy in the underground space occupied by the engine, as will be explained below.

The valve and valve seat are circular in form, and made of high grade bronze. The valve has a lift of from one to two inches, and an area of such amount as to reduce the speed of water to less than four feet per second. In other words, the valve area is figured entirely on the basis of plunger displacement. At the beginning of the stroke the valve opens automatically, controlled, however, by a very simple and effective mechanical device. It remains open practically the entire stroke. When near the end, it is positively closed at the proper moment by the controller.

The valve opening being large, all throttling of the water through the valve passages is avoided. The mechanical controller, closing the valve at the proper moment, prevents all slips and allows the pump to be run at any desired piston speed. In pumps having from 10 to 1,000 valves for the suction and as many more for the discharge, the water is forced to flow through a great many separate and contracted valve passages. This largely increases the friction, due to partial throttling of the water. In other words, there is less loss by friction, in water flowing through a single pipe of large area than there is in water flowing through a large number of smaller pipes of the same total area as the large pipe.

In the Riedler system, there is but one valve in the suction and one for the discharge. This greatly simplifies the pump end. On account of the mechanical control, the valves work equally well under all pressures. In some pumps, owing to the large number of valves required to get the desired valve opening, it is necessary in order to increase the speed of the engine to increase largely the number of valves. This results in making the pump end much larger.

In the Riedler system, because of the circular form of valve and the fact that all pressure parts are built cylindrical or spherical in form, it is simply necessary to slightly increase the diameter of the valve and its lift, thus greatly increasing the valve opening and slightly decreasing the strength of the pump body.

The manufacturers of the Riedler pump say concerning the question of high piston speed and its relation to valve area: "It should be remembered that the difficulty of running high piston speed in pumps is simply due to valve area; a small valve area necessitating the travel of water through it at a high velocity. Assuming the piston speed constant, by doubling the valve opening, the water velocity is cut in two. In the Riedler system the velocity of the water is kept very low, no matter what the piston speed.

"The advantage of high piston speed is in the greater efficiency of steam consumption. Nearly all high grade Corliss engines used for driving power plants and big manufacturing plants are designed for piston speeds between 600 and 1,000 feet per minute. As it has been found that this piston speed gives the greatest efficiency for these engines, why should not the same saving be made in pumping engines? The reason is, that until the introduction of the Riedler mechanically controlled valve this could not well be done. With the Riedler valve we may design our engine for its most economical piston speed and design our pump plungers to suit. This per-

mits us to start with the greatest efficiency in the prime mover. As our piston speed for normal running is near what it should be for an economical engine when working at half capacity, for instance, we still have a piston speed sufficient for securing good economy.

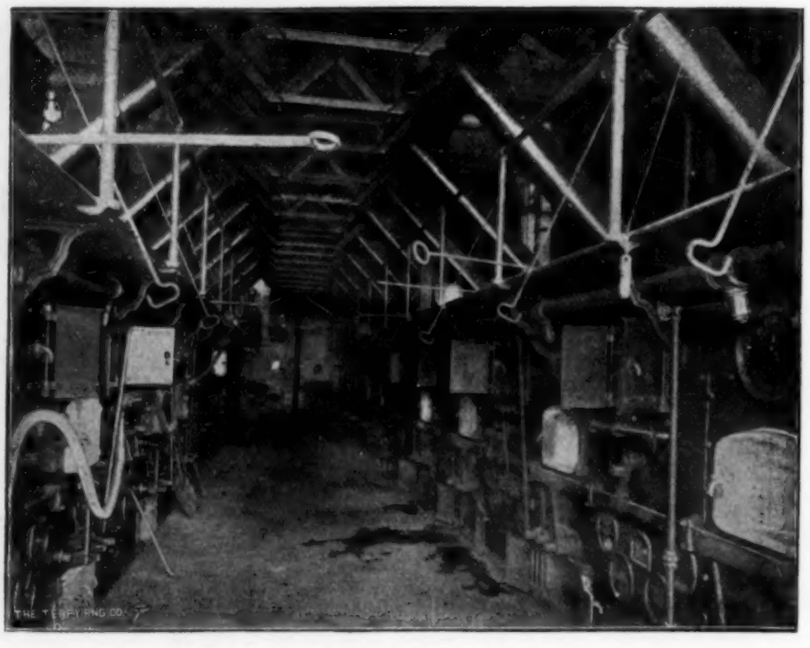
"Another advantage of the Riedler pump, due to the high number of revolutions it can safely be run, is the maintenance of continuity of flow of water, both in the suction and discharge pipes. On account of the greater number of revolutions, less water is pumped per stroke. The strokes following each other in rapid succession keep the water continually in motion, thus preventing the severe water hammer common in column pipes in which the water is allowed to come to rest at the end of each stroke.

"The valves are easily accessible. In case of obstruction between valve and valve seat, by a very simple device all injury to mechanism is avoided. From a record of over 825 pumps, the average life of these valves has been found to be about five years."

The weight of the new pump at the Chapin, with its condensers, is 346,000 pounds. It is expected by the builders that the pump may be run at the maximum speed of about 90 revolutions per minute, at which speed it will have a capacity of about 2,800 gallons per minute. The maximum speed guaranteed was 64 revolutions per minute.

COAL AND ASHES HANDLING PLANT.

The accompanying half-tone is a view of a complete Jeffrey coal and ashes handling equipment, as installed at the modern plant of the Cicero & Proviso Street Railway Co., at Chicago. The illustration clearly shows the boiler fronts with the overhead coal storage bunkers, from which the coal is fed on to the stokers. Wagons deliver the coal, either slack or lump, to chutes terminating over a double strand flight conveyor, which conveys the coal to a tooth crusher (if lump coal is used) to crush it to sizes. From this, it is spouted to a bucket elevator which raises and delivers it to either one of two spouts, one spout terminating over the upper trough of the initial conveyor, this conveyor carrying the coal to the storage bin, the other spout terminating over the cross-angle conveyor. The latter delivers the coal to a longitudinal conveyor, over the coal bunkers, gates being provided in the trough at points suited to the ready filling of the bunkers. From these bunkers coal is spouted to the mechanical stokers, as shown.



COAL AND ASHES HANDLING PLANT.

The ashes handling outfit is located in the basement and consists of two 12-inch cast iron spiral conveyors. These receive the ashes directly from the grate bins under the boilers and delivers them to the cross conveyor. Thence they are taken by a continuous bucket elevator and spouted to an ashes receiving tank on the outside of the building. Each part of the system is independently controlled by friction clutches, power for the whole system being furnished by an automatic engine located in the basement. This plant was designed and installed by the Jeffrey Mfg. Co., of Columbus, O.

LARGER TIN PLATE ROLLS.

The use of rolls of greater diameter than 24 inches for rolling tin plate has been urged at length in these columns as having a tendency to decrease roll breakage, improve the quality of the product, and increase the output. There have lately been installed rolls of larger diameter than 24-inch, as an experiment, and from all that can be learned, even the slight increases which have been made have proved advantageous. In several mills 25-inch rolls are being used, while one plant is equipped with 26-inch rolls throughout. In these cases the same housings which had been employed for 24-inch rolls were used, and these will not, in general, permit of rolls larger than 25 inches or 26 inches in diameter. So far as is known, no mills have been built with housings designed to take rolls larger than 26 inches in diameter.

It seems to be the general impression that if the diameter of the roll is increased, the number of revolutions per minute must be correspondingly decreased, so as to keep the peripheral speed constant. This means that, with an engine connected direct, less power can be developed. But it does not follow that the peripheral speed of the rolls cannot be increased when the diameter is increased. The roll of larger diameter has less curvature of surface, and accomplishes the reduction more gradually. For this reason, the peripheral speed of the rolls can be increased in proportion to the square root of the increase in diameter, and the reduction be accomplished as slowly as before. For small increases, this rule would decrease the number of revolutions by half the increase in diameter, and increase the peripheral speed in like proportion. Thus, in changing from 24 inches to 26 inches, the increase in diameter would be 1-12; if the revolutions per minute were decreased 1-24 the peripheral speed would be increased about 1 24, and the actual rate of reduction would remain practically unchanged. This will be made clear by a reference to the diagrams recently published in these columns, representing 24-inch and 48-inch rolls respectively effecting the same linear reduction, the larger roll showing a longer "arc of contact" through which reduction is going on.—[Tin and Terne.

In connection with other improvements on its furnace, made by the Norway Iron & Steel Co., of New Castle, Pa., 16 tuyeres have been provided, this being in line with latest practice, with the view of securing the greater volume of air that is regarded as a chief requisite of large outputs.

THE WESTERN FOUNDRYMEN'S ASSOCIATION

The regular monthly meeting of the Western Foundrymen's Association was held at the Great Northern Hotel, Chicago, April 21, at 8 P. M. In the absence of the president, the vice-president, Wm. Ferguson, took the chair. The following were present: Wm. Bailey, Illinois Iron & Bolt Co., Carpentersville, Ill.; C. A. Sercomb, Schwab & Sercomb, Milwaukee; G. H. Carver, Plano Mfg. Co., West Pullman, Ill.; S. T. Johnston, Whiting Foundry Equipment Co.; J. M. Sweeney, Harvey, Ill.; F. M. Lyon, Burlington Route Foundry, Aurora, Ill.; H. F. Frohman, S. Obermayer Co.; W. L. Getchell, Joseph Dixon Crucible Co.; O. T. Stantial, Illinois Malleable Iron Co.; D. L. Cobb, Sloss Iron & Steel Co.; E. W. Smith, Crane Co.; H. S. Vrooman, Garden City Sand Co.; Robert Barr, R. J. Cleveland, Cleveland & Barr; G. M. Sargent, Sargent Co.; H. L. Hotchkiss, Deering Harvester Co.; B. M. Gardner, *The Iron Trade Review*; Wm. Ferguson, Gates Iron Works; A. Sorge, Jr., consulting engineer; all of Chicago.

The only business before the meeting was the discussion of the proposed amendments to the by-laws and the nomination of officers.

The secretary read the proposed amendments and the original sections and they were thoroughly discussed, and the following were adopted by a two-thirds majority vote:

That Article 2, Section 1, be amended to read as follows: "The membership of this association shall consist of two classes, to be called respectively active and honorary members."

That Sections 2 and 3 of Article 2 be called Section 2, and to read as follows: "Sec. 2. Any person, firm or corporation engaged in the production of castings of any kind, as employed, superintendent, foreman, chemist, or any person whose knowledge or services are valuable towards the objects of this association may be elected an active member."

Section 4 of Article 2 to be amended and called Section 3.

Section 5, Article 2, to be stricken out.

Section 6, Article 2, to be amended and called Section 4, and to be made to read as follows: "Sec. 4. All nominations for membership shall be made in writing to the board of directors, who may, in their discretion, submit the nominee's name at the next regular meeting of the association, when a majority vote in favor of the same shall entitle the nominee to membership upon compliance with the provisions of these by-laws within three months after the date of his election."

Section 7, Article 2, to be amended and called Section 5 and made to read as follows: "Sec. 5. Each member who has duly qualified shall receive an appropriate certificate stating the date of his election, the certificate to be signed by the president and attested by the secretary."

Section 8, Article 2, to be amended and called Section 6, and made to read as follows: "Sec. 6. Active members shall have the right to vote at the meetings of the association; and any member shall be eligible to election to any of the offices herein provided for except as president, who must be actively engaged or financially interested in the foundry business."

Section 9, Article 2, to be amended and called Section 7.

Article 3, Section 1, to be amended to read as follows: "Sec. 1. Each person, firm or corporation who has been elected to active membership in this association shall pay to the treasurer the sum of $5 as an initiation fee before a certificate of membership shall be issued to him or it."

Section 2, Article 3, to be amended to read as follows: "The annual ues for each active membership of the association shall be $10, payable quarterly in advance."

Section 3 of Article 3 to be stricken out.

Section 4 of Article 3 to be amended and called Section 3.

Section 3, Article 5, to be stricken out.

"Sec. 6, Article 5. At any election, ballots cast by absent members shall be enclosed in special envelopes, sealed and addressed to the tellers of the election in care of the secretary. These special envelopes shall be provided by the association. In case there shall be no election on the first ballot, then a majority vote of the members present shall constitute an election."

Section 1, Article 8. That the order of business be amended to read as follows: Reading of the minutes of the last meeting; report of standing committees and officers; report of special committees; nomination of officers; election of officers; election of new members; unfinished business; new business; good of the association; adjournment.

The other amendments proposed were rejected.

The board of directors was authorized to properly number the articles and sections.

On motion, the secretary was ordered to prepare a list of the present members and to mail it with the report of this meeting.

On motion, the editing committee was authorized to publish the amended by-laws in pamphlet form in such quantities as the committee may deem best.

Nominations for officers for the ensuing year were then handed in and announced as follows:

President—C. A. Sercomb, Wm. Ferguson, W. N. Moore.

Vice-president—Wm. Ferguson, R. Cleveland, C. A. Sercomb, E. W. Smith.

Secretary—B. M. Gardner, A. Sorge, Jr., S. T. Johnston, H. S. Vrooman.

Treasurer—O. T. Stantial, S. T. Johnston, G. H. Carver.

Directors—G. H. Carver, J. M. Sweeney, A. W. McArthur, W. N. Moore, H. L. Hotchkiss, Geo. M. Sargent, S. T. Johnston, F. M. Lyon, A. M. Thompson, C. A. Sercomb, R. Cleveland, W. A. Jones.

Editing Committee—B. M. Gardner, Henry W. Carter, E. E. Hanna, H. F. Frohman, Wm. Ferguson, R. Barr, A. Sorge, Jr.

The meeting then adjourned.

PROGRESS IN THE IRON FOUNDRY.*

BY DR. R. MOLDENKE.

It is strange, but nevertheless true, that recent real progress in the foundry is closely identified with the extended period of business depression we are now going through. More money is being spent for improvements, plants are being remodeled to suit the requirements now more severe than ever, and a change is being manifested all along the line, which shows that the "happy-go-lucky" methods of former times are giving way to improved modes of procedure, coincident with the struggle for the survival of the fittest.

We see the old run-ways for taking up the metal and fuel gradually replaced by power elevators, thus doing away with the old foundry maxim—to buy no material which one man alone cannot take up to the charging platform. Greater care is exercised in the selection of the cupola, blowing apparatus, etc., and most notable of all, special attention is paid to the starting point of the industry—the material to be melted.

The natural question arises, what is bringing about this change? The answer is plain. Competition, close, searching, desperate competition in taking the little work to be had, and which has brought down the price on some classes of work which I had formerly cast for myself, from 5 cents to 1¾ cents, and in some cases the drop is even greater.

Progress by Scientific Methods.

Again, if we look for the means by which such radical changes in the organic life of the foundry business could be brought about, we see two phases of the same tendency, namely, economy and improvement. This brings us to the foundation of the whole business superstructure, which in its broadest interpretation is simply science—the systematic, logical dealing with the conservation of nature's wealth.

Possibly the average manager in ordering an electric traveling crane for his foundry, to run with his modern electric lighting plant, does not realize that this is what science is doing for him, yet how great is the improvement over the half a dozen stationary jib cranes with their limited reach, and run by man power, which are thus replaced. If he looks over the question of blowers, with a view of selecting the one which gives him the greatest range of pressures according to his needs, together with the least friction in the machine and consequent wear and tear; in other words, if he receives the maximum horse-power return, he may have saved only a little at the end of a year, yet remember "many a mickle makes a muckle," as our Scotch friends say. This discriminating process applied to the smallest item in the daily work, eventually places many a cool thousand on the right side of the ledger, and one finally comes to the conclusion that the best is often the cheapest. Now this is science, knowledge, common sense. These three words are synonymous in the foundry.

The careful study of the various aspects of a problem connected with the foundry, involving the notice of every possible requirement, present and future, as far as can be seen, the narrowing down of the matter to definite lines, careful selection of the course to be pursued, proper installation of the apparatus which may have to be purchased, surrounding the operation itself with all the safeguards which are of practical value, and then following the matter up by competent talent,

*Read before the Pittsburg Foundrymen's Association Monday evening, April 26, 1897.

to see that the original efficiency is maintained, and new improvements suggesting themselves adopted—this course of reasoning and action may be summed up into one sentence: "Science gives the best practice"—an axiom the truth of which is becoming more widely recognized daily.

While we are at the subject of science in the foundry, and have in mind many costly mistakes in this direction, it would be well to look more closely at this matter with a view of aiding those who are about to take up this important subject in conjunction with their established work.

An old German professor once expressed himself as highly displeased at the fact that science was dragged from the universities into practical life. The hard-handed and hard-headed practical man formerly scoffed at the "scientific fellow." Both men, in the light of the new foundry practice, are far behind the times, yet both men can hardly be blamed. We have, for instance, the learned savant, as a rule shortsighted and seldom practical, who chases scientific rainbows and passes veritable gold mines in following some particular hobby. Then the young graduate, who has his years of experience yet to acquire, and to learn to adapt scientific research to the needs of the hour; these classes of men, the rule rather than the exception in their domain, make the ironmaster hesitate about seeking their services. On the other hand, we have the man who does not believe in book learning, who relies on the few formulæ he has picked up and learned to apply—the so-called "hand-book engineer," who never lets a problem pass him without making a break at it, at other people's expense. This is the man who use a big factor of safety to cover up the deficiencies he is conscious of, and who usually spoils the excellent workman he has been and makes an indifferent chief. The industrial world is therefore coming to learn, and the foundry, in particular, must learn, that while for the inferior positions about the laboratories and mechanical departments the self-trained young man with his praiseworthy ambition of graduating into the shop and eventually acquiring a foremanship, is the best to employ, yet for assistants the technical graduate, if at all suitable, may be trained to become a valuable money-maker for his employers. Where, however, the study and perfection of special lines of work is desired, it will pay to utilize the highest grade of talent as the quickest and cheapest means of arriving at paying results. This, of course, is expensive, but I know of one instance where a firm quietly bought up the scrap piles of its neighbors and turned them into hard cash by learning to know how.

Possibly the secret of successful work in any line is to make up your mind that you do not know it all and can learn very much more. Only such a man is willing to make an attempt to distinguish the wheat from the chaff.

Chemistry Must Be Supplemented.

Those of you who are acquainted with the wonderful achievements of chemical research, such as determining the compositions of stars we cannot see with the naked eye, must wonder at the somewhat confusing state of the literature we have been getting on the chemistry of foundry work. This has led some eminent workers to lose faith in the chemistry of iron, and turn entirely to the physical aspects of the case. They do not realize that it is not pure chemistry which we need, but metallurgy.

This branch of the applied sciences requires chemistry as the basis of its methods, but draws on mechanics, mining and engineering in general—branches which the everyday chemist is usually ignorant of—to aid in rounding out a system of handling the iron in all its stages in the foundry and machine shop, as it makes its rounds.

If, therefore, chemical work is supplemented by the proper testing methods, trial heats, or other suitable physical determinations of quality, the best results will be obtained, and light will come to those already confused by one-sided or contradictory statements. Remember that no time need be wasted in making any experiments whatever on irons whose chemical composition makes them inherently unfit for your use in the first place.

In looking over the ground indicated by our subject, we see how decided the waking up in the foundry has been. Goods are no longer bought on faith, but are put to the severest tests before anything is said about payment. In fact, certain requirements are laid down flatly before the matter of investigating is thought of. This is a healthy sign, and will eventually mean the crowding out of worthless and unnecessary material. It may be regarded as a distinct sign of progress that we no longer hear of those nostrums which were supposed to give such wonderful properties to the metal.

Points in Cupola Practice.

There is a demand for better apparatus for the foundry, higher efficiency in its use, and more uniform results. Sometimes the demands are too high and pass the point of real economy. Thus, if any one can efficiently and continuously melt 17 pounds of iron with one pound of coke, he can beat me. If the jobbing foundry make it 11 to 1, I would call this excellent and safe work. A good foundry foreman need not be discouraged if he can show no better results than 9 to 1, as so much depends upon the coke, the class of work, and the peculiar knack he may have in handling his cupola to the best advantage. It may not surprise you that to make certain kinds of very small castings, requiring intense heat for successful pouring, 4 to 1 is used.

It seems to me that when too little coke is used, the bed becomes too thin, and even should the iron be sufficiently hot for pouring, there must be some danger of an absorption of oxygen from the blast, and consequently castings will result which are weaker than they otherwise would have been.

The number and types of cupolas is rapidly multiplying, that is, on paper. This is at least encouraging, as it shows that experimenting is going on, which will cause the well-established makers to add every possible improvement to their product, thus in turn benefiting the subsequent purchaser. It would seem to me that by keeping to a type of cupola which is economical in coke and at the same time simple in construction and handling, the best all around results will be obtained. Those who use "Siemens-Martin" furnaces for their larger castings will have found a great improvement here also. The dream of the metallurgist has at least been fully realized in this instance, for we can now work with a gas at all times, and reap the advantages this easily handled form of fuel bring with it. While we must naturally hope that the cessation of the natural gas supply is at some distance off yet, the coal gas producer has been nevertheless perfected to such an extent that it would be going backward indeed if even small plants were to take up direct coal firing again. With the regeneration of both air and producer gas, temperatures are obtained which answer every purpose for steel or iron making. While we may never be able to make a gas as rich as the natural, with its 25,000 heat units to the pound, still undoubted success has attended the introduction of producers which combine in one operation all the advantages of the old Siemens, the water gas and the bench distillation types, even though the heat units per pound are but one-tenth those of the natural gas.

In looking over the field of apparatus for producing blast, we find that the fans are being brought down to more careful workmanship, so that there is less loss by friction, while the positive blowers, which I personally prefer, are now beginning to show improvements on mechanically correct lines, which also means less wear and tear and better results for the coal burned to run them.

The Question of Power.

The boiler question is at all times a serious one, as good boilers cost money, and the first cost is always watched so carefully. Modern practice is coming down to the water tube type as the most efficient, and for larger plants provision should be made for mechanical stoking and coal conveying.

Those who are fortunate enough still to use natural gas at advantageous terms for this purpose are not very numerous, but whatever selection is made among the numberless boilers in the market, care should be taken to have plenty of heating surface per rated horse-power, and a good evaporation per pound of combustible. This is to say, do not let any one sell you what would be rated a 100 h. p. boiler for your foundry, when you require 125. The first cost is often cut down by reducing the heating surface in the hope that forcing the boiler will make up for its poor steaming quality when running normal. The coal pile would soon show you what you were at.

It is interesting to find Corliss engines, running condensing, and often compounded, in places where their application, on account of the comparatively slow speed they run at, was heretofore considered inadvisable. Here, as well as in the

conveying apparatus in the foundry, is the field for the trained mechanical engineer. How many engines in the foundries here in this city are regularly indicated to see if they are in proper working condition? And as to boiler tests, are they not the exception rather than the rule? So also with feed water heating and purification. I remember not long ago a chief engineer of a fairly large power plant was sent about the country to learn something about the economy of running his engines condensing, and came back with his mind made up that there was nothing in it. For the credit of the plant I will add that he is no longer there, but this will show you that while the market will furnish the most economical appliances possible in the light of our present knowledge, yet this is not taken advantage of as it should be, especially in foundries, because the power plant is usually considered a secondary matter here.

Labor-Saving Equipment.

Where the castings are finished, such as in roll work and the heavier grade of machinery, we have in this city excellent examples of splendidly equipped plants, but the majority of the smaller foundries proper pay a disproportionate amount of attention to reducing the cost of molding per ton of output, compared with the numberless items not connected with the sand pile.

The last few years have witnessed a remarkable extension of the use of conveying apparatus in foundries. It seems like a regular evolution, step by step, until we now have as the most advanced, flexible and efficient piece of apparatus for this purpose, the electric traveling crane. This, with its three movements, capable of quick and accurate regulation, and only consuming power when running, gives an ideal method of carrying the molten metal to the molds, takes care of all the lifting and shaking out of flasks, and handles the finished work so nicely, that the cranes are a source of pleasure in addition to profit to those that possess them.

On the question of compressed air in the foundry I will only say that what would be a waste in one place, becomes the best economy in another. Compressed air for some things is necessary no matter if it does entail a loss of the greater part of the original power applied. Again, where there is a choice between it and electricity, the latter will usually be found the most efficient and least costly in repairs to the installation. Here, as well as for those cases arising in connection with the manufacture of specialties, it requires expert knowledge and sound judgment to choose the right thing for the right place.

In regard to the question of molding machines, these might be compared to the machines for turning out standard screws by the thousand. They reduce wonderfully the cost of the smaller castings, when made in quantity, and should aim at taking away the hard labor of the molder, but not that of his brains. It will, therefore, be found to pay to have a good molder in charge of the molding machines, with cheaper help to assist him; for sand must be tempered properly, cores set carefully, and attention paid to the smaller manipulations which make or unmake a perfect casting, and are the easier portion of the molder's work.

We have now four methods of cleaning castings to choose from. The old way with the steel brush, which will always remain for some purposes; the rattler, or the pickle tank for the smaller class of castings, and the sand blast for the very large ones. The sand blast is now sufficiently perfected so that we can use either steam or compresssed air to project the sharp sand against the work and thus thoroughly clean it.

The rattler has the disadvantage of now and then breaking important work, so that the pickle tank is often the proper solution for this difficulty. We have the choice between sulphuric and hydrofluoric acids. The advantages of the latter are so obvious to those who have used both, that they prefer it. It dissolves the sand and not the iron. Its greater cost has been found to be no bar to its more and more extended use, especially for work which goes to the enamelling or nickel plating shops.

Cost Sheets.

Before we go into the question of the iron proper, there remains but to mention the importance of proper cost accounting in the foundry. In this country we have been accustomed to so comfortable a margin until recently, that there have been many leaks in our costs, which we now see too late. In the old country this is quite different. For instance, in the most densely populated industrial districts in the world, namely, those of Belgium, cost sheets are prepared every fortnight, and thus the slightest deviation from the standard is detected. It is more than likely that our greater and cheaper output for the number of hands employed, when compared with Europe, is not due to economical working so much as it is to better methods, and the greater individual efforts each man must make to gain his livelihood. For the steady growth of a concern it is of vital importance that ready means should be had by the manager to know just what every department is doing at very short intervals.

Most Important of All—The Iron.

Taking up in conclusion the question of the iron itself, as used in the foundry, I will make the general statement that all iron is good for something, even if it be only floor plates or sash weights. This is no reason, however, why you should experiment with it at your cost, when you can satisfy yourselves of its possible value in other comparatively inexpensive ways.

The whole foundry industry was practically of a slow and cautious growth. It was a process of feeling one's way onward to the easiest and best methods of melting the then available iron to produce suitable castings. Science has stepped in afterwards, and taken the proven methods, discovered the principles underlying them, and thus was able to point out their limitations and suggest new lines of departure. It is therefore well to follow this slower process of development, even when applying the results of investigation, rather than jumping into too radical changes from tried and positive methods. Thus, in the gray iron foundry, if the closer pressure brought on by competition begins to push toward cheaper mixtures, it will be well to first thoroughly learn the why and wherefore of what you are now doing successfully, and then make the necessary changes slowly and with a thorough understanding of each new result obtained. For instance, in a line of work which requires very fluid iron for making light and intricate gray castings, suppose certain brands of high phosphorus pig irons have been used for many years, and that this iron is expensive. Now you are offered cheaper irons, and desire to avail yourself of this chance, if possible. You will find it well to get first an analysis of what you use, and if practicable of what you have used, getting as wide a range of charge compositions as you can find, but always where good results have attended. Now you can begin to substitute first one item, then another; after this two at once with wider variations, but always with the sum total the same. This means silicon, manganese and phosphorus. Sulphur must be kept down at all times, while carbon seldom gives trouble in the foundry, being practically constant in the pig iron, and in form dependent on the other above named elements. It will be safe not to go too far with this use of widely varying material, for perfectly homogeneous baths of metal do not always result, it being well known that the forge irons melt easier than the foundry number ones and twos. I do not think it very wise to use nearly all scrap and bring up your charge properly by using ferro silicon, as is now recommended. The lack of uniformity in the iron will be apparent to all who may have tried it. It is quite possible that good results might be obtained this way, but there are other objections of which I will speak further on.

In nearly all classes of work the above process, as I have outlined it, is readily carried out; the only difficulty that will arise may be found in foundries which are compelled to buy large amounts of foreign scrap. Here they will be to some extent at sea, and only judicious sorting, careful sampling and numerous analyses continually checking the daily work and the stock on hand, will enable them to keep their product uniform. This is in my opinion quite possible, if, as I said before, the greatest care is taken in finding out what you get. Herein center most of the troubles of the foundryman.

We have then to deal with the following conditions in making up our charges: The pig iron, gates and runners from previous work, foreign scrap, and the coke,—taking for granted that the regular conditions prevail in regard to handling the cupola. The question of pig iron was usually taken up on its fracture and capacity for carrying scrap. We now know that fracture depends upon the way the ore is handled in the blast furnace, in addition to the chemical composition

of the resulting pig. The fracture alone is therefore no criterion. The capacity of rich foundry pig for carrying scrap depends practically altogether on its silicon contents. For the cheaper pig irons especial care must be taken to see that the composition is not only what has been called for, but also that it is uniform. Furthermore it is well to check the furnace analyses, experience having shown that this does no harm. One of the sins that can be laid to the door of the poorer grades of pig iron is the traces of slag they contain, and this feature, to which almost no attention is paid, may have an important bearing on the resulting castings.

The next item to be looked at is the daily collection of gates, runners, defective castings, and such material which may have been dumped out. This is practically scrap of which we know what it is, and can therefore readily make provision for its use. We must look at it for two things: First, that the charges in which it is to be used make up for the loss of silicon which has taken place in the previous melting; and, secondly, that only the quantity be used which experience has indicated as the best to obtain the proper grain in the castings, if I may so call it. We see therefore that in foundry practice much depends upon what may be termed the physical conditions of the iron, irrespective of its chemical contents. Thus, two irons may have the same chemical composition, have been cast at the same temperature, and yet have a different grain on fracture. Very much of this can be traced to the proportion of scrap used to pig.

In the charging of the cupola it is to be understood, of course, that in the mixing of the separate layers the latter are to be made as uniform as possible, unless, for other reasons, it is desirable to give the material richer in silicon and with a greater proportion of pig the bottom position; as, for instance, in making castings for electrical purposes, where the greatest magnetic permeability is desired and the first pour is specially arranged therefor.

It is furthermore desirable to pour the iron as cool as possible, consistent with proper feeding through the gates in the molds. This gives the slag which may not have separated in the cupola time to collect at the top and can thus be kept out of the castings. This point is not always fully observed, for probably one-quarter of the silicon and manganese in the charges is burned out in the melting, and this makes slag in the iron, which must be allowed to separate. If the iron is very hot it will readily come up, especially with the rich foundry irons which require higher temperatures to melt and are therefore accompanied by comparatively liquid slags. But the forge irons, which melt more easily have their slags nearer their melting points, and consequently are apt to be dirtier when cast. This point about slag is the special objection to using ferro silicon with great quantities of scrap. The scrap itself is probably none too clean, and the rich ferro silicon, melting off in drops, is naturally affected by the blast, and has burned out of it a greater proportion of its silicon than would have been the case with the silicon more evenly distributed throughout the charges. The result must tend toward lack of uniformity, and danger of dirty and therefore weak iron.

The matter of slag in castings is most readily studied in the making of steel ingots. Here the chilling of the surface of the ingot drives the more fusible slag inwards, and being lighter and aided by the formation of gas, it rises to the surface. The bearing of this on cast iron, even if in lesser degree, is obvious.

Those of you who are inclined to look more deeply into the philosophy of iron making, have probably found that we can learn more from failures than successes. Thus it is in this instance: If you get weak castings, you look about for the cause; if they were good, you would not bother about them. You will have the weak castings analyzed, and might find the trouble. Possibly there is too much manganese; this you can correct in the next day's run. But suppose you find the chemical condition normal. Then, to my mind, there may be two solutions: The presence of slag in the iron, either as lumps, or as a fine network which is not visible to the eye, disseminated between the crystals of iron; or, it may be the presence of oxygen due to burning the iron. This is another of the questions connected with the foundry which has received little attention, and brings us to the consideration of the foreign scrap which we have to buy in the course of trade.

Suppose you were to use as part of your charge a lot of burned grate bars, would you expect strong iron as a result? Hardly! Here is a clear case of a material which requires the reducing action of the blast furnace, or else the basic open hearth bath for steel to make it useful again, and not the remelting in the cupola, which aggravates the evil instead of correcting it. Every pound of such material will be found to affect your work. And now what guarantee have you that the material you buy does not contain some dirty or burnt iron, or scrap made from it? The result is the weakening of the bond between the crystals of the iron, and hence in extreme cases, rotten castings.

With the coke used it becomes a question of sulphur. No matter if there have been good sound castings made with high sulphur in them, I believe it is a good thing to avoid, for a casting may be good in spite of the sulphur, and not because of it. Coke with high sulphur is therefore better let alone, and modern coke washing processes have given us the means of reducing this deleterious element to a minimum. Three per cent is often found in cokes before washing, about one-half of which is removed in the operation.

In the foregoing remarks I have tried to take up the foundry question more from the somewhat neglected engineering standpoint rather than the strictly chemical one, and have avoided as much as possible a discussion of the painfully elaborate theories connected with the iron industry; for experience shows us that even with a perfect composition of our charges, carelessness in handling can ruin the work, whereas if the mixture is off, no amount of attention in its manipulation will correct it. I am inclined to think that as time passes on, everything will tend toward a more simple explanation of the occurrences which now puzzle us, and as the underlying truths gradually come to the surface, the field of view will broaden, and we will begin to see things more as they really are. It may be years yet before even the more common phenomena are satisfactorily explained, and in the meantime it behooves us not to jump at conclusions too soon, but to take that which is good, and carefully look out for further enlightenment in this most interesting, and, when conditions permit, highly remunerative field.

Roller Bearings for Machinery.

It is reasonable to believe that the modern roller bearing is capable of far higher speeds than ordinary journals, without undue wear or danger of heating, and without the necessity of those elaborate devices for supplying a continuous stream of oil which present practice frequently demands. For the roller bearing requires but little lubrication under severe conditions of service, and none at all when the speed is very slow, as in trucks and hand cars.

With so much to commend them, it may be asked, "Why are not roller bearings in more general use on machinery?" In reply it must be stated that their use is rapidly and steadily increasing. The mechanical world has never been so alive to their advantages as it is to-day, and new applications are constantly being discovered. It is a matter of regret that lack of space forbids a detailed description of more of these, for even now the variety of uses to which they have been put and the benefits accruing from their application are not generally understood.

Again, the question of price operates to retard their wider adoption. It is comparatively easy to introduce an improved device at the same price as that at which its competitor is sold; but it is not so easy to convince a buyer that the improvement warrants the payment of a higher price. Above all, however, the roller bearing has to overcome the strong prejudice which a long and hitherto uninterrupted record of failures has naturally raised against it. Old mechanics say: "Yes, we tried roller bearings 25 years ago. They didn't work."

To them this may be sufficient evidence to convict. Possibly they forget, for the moment, that the world, especially the mechanical world, has taken enormous strides forward since then; that 20 years ago it was predicted that the telephone would never be more than a toy; that few mechanical devices are perfected in a day, and that the problem of successful mechanical flight, though it has at least as many failures charged against it as have roller bearings, is still able to command the efforts of some of the best engineers.—[H. A. Richmond in Cassier's Magazine.

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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

At Uniontown, Pa., a deal has been completed by the board of trade for the establishment of new radiator works. John D. Carr, Evans Lynn, H. A. Burchinal, Max Baum and James Mellon are the directors and they have applied for a charter. The old plant of the Pittsburg Architectural Iron Works, owned by the Dollar Savings Bank, of Pittsburg, has been leased and will be remodeled. The new plant will start within a month and will emply about 75 men.

The Flour City Molding Works, of Rochester, N. Y., has been formed. Messrs. H. B. Hathaway, of Rochester, and Thos. Ferguson, of Brooklyn, N. Y., are interested.

Damonte Bros.' Shipyard, Audubon X Water, New Orleans, La., asks prices on punches, shears, binding rolls, etc.

The Carter Mfg. Co., Louisville, Ky., will buy lathes, band saws, etc.

Hoffman & Ahlers, Louisville, Ky., are in the market for brass-working machinery.

The city of Cleveland is advertising for 1,200 h. p. steam boilers, bids to be in by May 19. The contract involves, also, the erection of mechanical stokers, ash conveyor and smoke flue.

The Turner Engineering Co. has been established at Marion, O., to build a boiler designed by George E. Turner, superintendent of the Marion Street Railway Co. The officers are: President, Geo. B. Christian; vice-president, H. Ackerman; secretary, Frank Keiler; treasurer, W. H. Schaffner, and superintendent, George E. Turner.

At the office of the supervising architect, Washington, D. C., sealed proposals will be received until 2 P. M., May 18, for furnishing all the labor and materials and fixing in place complete the heating and ventilating apparatus required for the United States Post-office Building at South Bend, Ind.

A new foundry is to be established at Harrisburg Pa., by J. Weber, who will occupy the old Bay Foundry.

New Construction:—

At Lima, O., the C. H. & D. Railroad has purchased property near its shop site and will soon begin rebuilding the car shops.

At Greenville, Pa., the new brick structure being erected at the Greenville tube mill is being pushed along rapidly. The steel frame work is nearly completed, and the Penn Bridge Co. has a large force of men at work. The main building of the mill is now 615 feet long by 250 feet wide.

The Chicago Shipbuilding Co. will soon begin the erection of a large machine shop.

Work has begun on the rebuilding of the Derwent foundry at Ellwood City, Pa., which burned some weeks ago. The capital stock has been increased. Three large brick buildings will be erected and several smaller ones.

The contract for the new shops of the Georgia Southern & Florida, at Macon, Ga., has been given to Nicholas Ittner, of Atlanta, the contract price being about $30,000. The new buildings will comprise a machine shop, 90 x 160 feet, a blacksmith shop, 45 x 120 feet; a roundhouse, 70 feet deep, with eight stalls; an engine-room, tool-room, pattern shops, and other smaller buildings. The buildings will be brick, with steel truss roofs, and the flooring will be vitrified brick, laid in cement.

The Pittsburg, Bessemer & Lake Erie Railroad Co. has secured 15 acres of land near Grove City, Pa., on which it will erect a roundhouse, turn-table, repair shops, etc.

The Norton Iron Works, of Ashland, Ky., are about to contract for the erection of a rod mill in connection with the nail works of the company. A steel structure will be erected equipped with modern machinery.

The Missouri, Kansas & Texas Railroad will shortly commence the erection of extensive shops at Sedalia, Mo. Specifications for the buildings have been completed, and show a freight-car shop 110 x 224 feet passenger paint shop, with stock room addition, 150 x 164 feet; machine shop, 60 x 175 feet, and blacksmith shop, 60 x 125 feet, both to cost $8,760; engine and boiler house, 50 x 100 feet, and wood mills, 80 x 150 feet; passenger erecting and upholstering shops, five tracks, 100 x 146 feet. T. C. Purdy, St. Louis, is general manager.

At Fitzgerald, Ga., W. T. Swain, of Savannah, Ga., and C. E. West, of Big Rapids, Mich., will erect and operate a foundry and machine shops.

Work has begun on the new foundry buildings of the Walker & Pratt Mfg Co., Watertown, Mass. They will furnish about 110,000 square feet of working space.

Additions, Enlargements, Removals, Etc.:—

The additions to the plant of the Pittsburg Tin Plate Works at New Kensington, Pa., include three new hot mills. The cold mills formerly used will be removed to the new mill. About 400 h. p. of boilers will be installed. The contract for the foundation work and tin stacks has been let to E. E. Erikson, Conestoga, Bldg., Pittsburg.

The Cornell Iron Works will remove their foundry from New York to Cold Spring, on the Hudson.

At Reading, Pa., the Acme Mfg. Co. will enlarge its plant.

The Riverside Machine Works, Kokomo, Ind., owned by Apperson Bros., will be enlarged.

The Duvall Engine & Machine Works, of Roanoke, Va., have been purchased by Pennsylvania capital, and it is said will be removed to Columbia, Pa. The plant is quite well equipped.

W. F. & John Barnes Co., Rockford, Ill., have built a brick addition 50 x 100 feet, four stories high. Their buildings now run 250 feet by 150 feet. The foundry, which covers a space of 50 x 100 feet, is on the river in the rear of the factory.

Fires and Accidents:—

Fire destroyed the spoke and handle factory of Christopher Strom, at Bristolville, near Warren, O., April 23. Loss, $12,000, with insurance about half.

The plant of the Grand Crossing Tack Co., Grand Crossing, Chicago, was almost entirely destroyed by fire April 18, caus-

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ing a loss of about $150,000, nearly covered by insurance. It is understood the plant will be rebuilt very soon, as the company has a very large trade and numerous orders on hand.

The boiler works of John Mohr & Son at South Chicago were damaged by fire April 21, to the extent of $2,000.

The Dickson Foundry & Machine Shops at Dickson, Tenn., burned April 22. The loss is uninsured.

General Industrial Notes:—

Henry Aiken, Pittsburg, has the contract for new equipment for the Bessemer department of the Bellaire Steel Co., Bellaire, O.

The Rand Drill Co., 1328 Monadnock Bldg, Chicago, has received an order from the American Tin Plate Co., Elwood, Ind., for a cross compound air compressor. The company has also received an order for a similar compressor from the Ball Bros. Glass Mfg. Co, Muncie, Ind., and for a large cross compound air compressor from the Cleveland Ship Building Co., Cleveland, O. The Van Dorn Iron Works, of Cleveland, has bought a duplex air compressor from the Rand Drill Co.

The Brightman Furnace Co., Cleveland, reports a decided increase in its stoker sales. Besides five large stokers the company is building for Cleveland Water Works, it has the following orders on hand: Two for Pfister & Vogel Leather Co., Milwaukee; two for Goeky & Son, shoe manufacturers, Jamestown, N. Y.; four for Buffalo State Hospital, Buffalo (sixth order); three for Japan, one for Paris, France; one for Hamburg, Germany.

At the National Rolling Mill, McKeesport, the puddlers have struck against the reduction from $4.50 to $4 a ton. The Pittsburg Forge & Iron Co. has followed several other iron mills in making a like cut. There are two mills in the Pittsburg district, however, at which a lower rate prevails.

Shenandoah Rolling Mill, of the Shenandoah Furnace Co., at Shenandoah, Va., has been purchased by W. J. Carlin, of Thos. Carlin's Sons, Allegheny, Pa. It is uncompleted, work having been suspended in 1892. The buildings are of steel and the equipment is modern. The building plant will be sold by the present owner.

A Cincinnati dispatch says that 250 employes of the Addyston Pipe Co. struck against a new regulation, requiring them to work by the piece instead of by the day.

Sales of iron by the Tennessee Coal, Iron & Railroad Co. last week are put at 12,000 tons. It is not expected that there will be any strike by the coal miners employed by the company. The contract now existing runs to June 30. It is believed at that time the men will accept the proposed reduction with a guarantee of steady employment. Warren, O., reports

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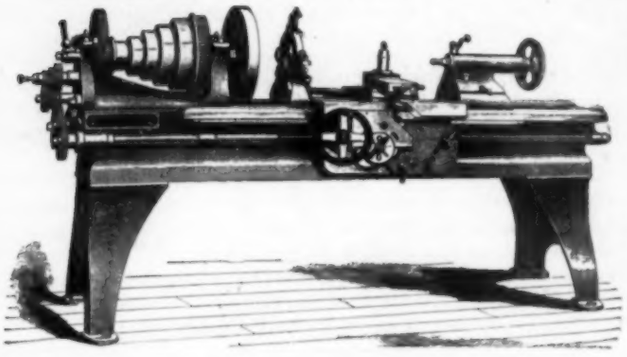

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LAKE SUPERIOR CHARCOAL PIG IRON,

Antrim, Elk Rapids, Gaylord, Hinkle,
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All business connected with the sale of the above brands of Charcoal Pig Iron will, from April 1st, 1897, be handled by THE SUPERIOR CHARCOAL IRON CO., of Detroit, Mich., which is thus enabled to supply the best iron known for all purposes, especially for Car Wheels, Malleable Castings, Boiler Tubes, Ship and Armor Plate, strong high Silicon for foundry purposes, Basic Pig Iron with the minimum of Silicon and Sulphur, also iron to take the place of Salisbury, Southern, and Swedish Charcoal Iron.

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1,500 men now employed there, a considerable increase over last year at the same time. But one industry is idle.

Dover Furnace, of the Penn Iron & Coal Co., at Canal Dover, O., blew in on April 22, after being out for nine months. The product will be foundry iron, and later Bessemer.

Forty locomotives are now under contract at the Brooks Locomotive Works, Dunkirk, N. Y.

The Ashland Steel Co. has made a contract with Pittsburg manufacturers for some new equipment.

Two additional Michigan charcoal furnaces will go in blast. Excelsior, at Ishpeming, expects to resume early in May, in the completion of repairs to its hearth. Weston Furnace, Manistique, will probably go in again about the middle of the year.

The production of charcoal iron by Michigan furnaces in 1896 was 146,869 tons, as against 88,700 tons in 1895. The output by furnaces in 1896 was as follows: Antrim, 32,134 tons; Elk Rapids, 16,885 tons; Excelsior, 17,906 tons; Gaylord, 10,563 tons; Peninsula, 6,542 tons; Spring Lake, 25,610 tons; Pioneer, 23,849 tons; Union, 13,380 tons.

The Bellaire (O.) Steel Co. has given a contract to the Bellaire Boiler & Bridge Co. for two new 10-ton cupolas for the Bessemer department.

At Akron, O., the Enterprise Mfg. Co., manufacturer of fishing tackle, luminous bait, and other specialties, has purchased a large brick building, for many years occupied as a school building and recently abandoned. The structure will be rebuilt and extended and occupied by the Enterprise company.

At Easton, Md., Wm. H. Withgott has purchased the schoolhouse, which he will convert into a machine shop.

The Consolidated Steel & Wire Co. has declared the quarterly dividend of 2½ per cent, payable May 1 to stockholders of record April 24.

The Pittsburg Screw & Bolt Co., of Pittsburg, was chartered last week with a capital of $50,000. The incorporators are D. A. Moore, N. C. Moore, Mary P. Smith, H. E. Bidwell, Jesse T. Lazear, N. C. Davison, W. H. Williams and M. M. Currey.

The steel department of the Maryland Steel Co.'s works at Sparrows Point will resume on May 1. More than 300 additional men will be employed.

The Michigan-Peninsular Car Co. has orders from the Mexican Central for 325 box, 150 coal and 75 stock cars, and from the Northern Pacific for 150 flat cars.

The American Corrugating Co., of St. Louis, has reorganized under a new charter. The plant has been supplied with new machinery. R. B. Whittemore, who was president of the old American Roofing Co., is president of the new concern. B. P. Lloyd is vice-president and A. P. Whittemore secretary. The American Roofing Co., in its turn, was formed by the consolidation of the Sagendorph Iron Roofing & Corrugating Co. and the Missouri Iron Roofing & Corrugating Co. At Cincinnati, Geo. M. Verity, who was in charge of the local branch of the American Iron Roofing Co., has organized a new roofing and corrugating company, of which he is president.

The Tonawanda Iron & Steel Co., North Tonawanda, N. Y., is equipping its Furnace B with additional tuyeres. The older furnace, A, is in operation meantime.

The employes of P. L. Kimberly & Co., at Sharon, Pa., are considering a proposition to operate the mill for a short time. Some months ago the management offered to pay any of the puddlers who chose to work rather than remain idle $2.25 a day. There was no disposition to accept the offer. Recently Mr. Kimberly told the men that if they wanted to experiment as to the cost of making muck bar on the present basis he would sell them $1,000 worth of iron and turn the mill over to them, giving them a bookkeeper to keep an accurate account of all costs, and then sell the resultant product. This is the basis for the report that the mill is to start up under a co-operative arrangement.

The Pennsylvania Steel Co., has started its billet mill at Steelton, Pa., and its No. 2 furnace, the largest at the plant, is nearly ready for blast after a number of improvements.

Thomas Carlin's Sons, of Allegheny, have just secured an order for a complete contractor's plant, to be used in the construction of United States Government fortifiations. The equipment will include special long span traveling cranes and hoisting engines; concrete mixers and conveyors of new design, a large steam power plant, and 20 ammunition hoists and cranes.

The basic open-hearth steel plant under construction by the Shoenberger Steel Co., of Pittsburg, is nearly completed. The company will start the second blast furnace in a short time on basic pig for the open-hearth plant.

S. Frank Eagle, of Chicago, has leased the Bessie Furnace, at New Straitsville, O., and will blow it in July 1 on high silicon pig iron.

For the past two months the Ætna Standard Iron & Steel Co., Bridgeport, O., has been making a larger output than in January and February, with prospects of better operation as the year advances. Merchant iron and steel, sheets, tin and terne plates are the chief products.

The sinking of the engine foundations at the tin plate plant of the Irondale Steel & Iron Co., at Middletown, Ind., causes a shut down for several weeks. The engine is 600 h. p.

The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for furnishing for the government of Limon, Costa Rica, a market building constructed entirely of steel. The framework of the building will be of light skeleton steel work. The roof covering will be galvanized iron with ornamental cresting and cornices. This building is constructed in the form of a quadrangle 120 feet square. The interior court is 40 feet square, in the center of which will be placed a fountain. Each side of this quadrangle will be 40 feet wide. Completely surrounding the building will be placed an ornamental iron fence provided with large entrance gates. The gate posts will be surmounted by elegant wrought iron lamps.

The Central Iron & Steel Co., of Harrisburg, Pa., has been granted a charter. The capital stock is $1,000,000 and the incorporators are James McCormick, J. D. Cameron, Vance C. McCormick, Henry B. McCormick, James M. Cameron, Charles L. Bailey, Edward Bailey and Gilbert M. McCauley, of Harrisburg, each one share; William Wallace, Brooklyn, N. Y., and J. Frederick Kernochan, of New York, each one share; the Paxton Iron & Steel Co., of Harrisburg, 3,570 shares; the Central Iron Works, 4,550 shares, and Charles L. Bailey & Co., Inc., 970 shares. The directors are James McCormick, Henry B. McCormick, Vance C. McCormick, James M. Cameron, Charles L. Bailey, Gilbert M. McCauley, Edward Bailey, Wm. H. Wallace and J. Frederick Kernochan.

The Davis Coal & Coke Co. will build from sixty to seventy new coke ovens at Coketon, W. Va.

At the monthly meeting of the Engineers' Society of Western Pennsylvania, held in the lecture room of the Society's House, 410 Penn avenue, Tuesday evening, April 20th, a paper entitled "Transmission of Power by Compressed Air" was read by Mr. Richard Hirsch. He compared this method of transmission of power with the various other methods in vogue, and gave a detailed estimate of the cost of a plant with a capacity of 1,100 h. p., if erected in Pittsburg. Some of the statements in the paper were the subjects of animated discussion by the members of the society, in which advocates of the gas engine and electricity took a prominent part.

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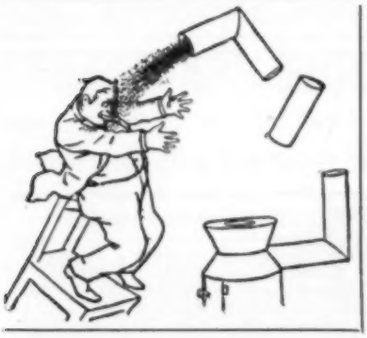

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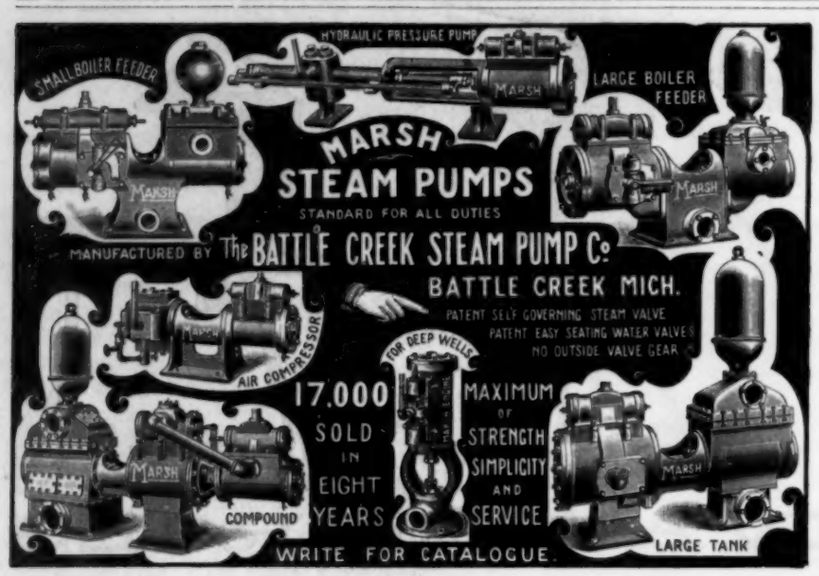

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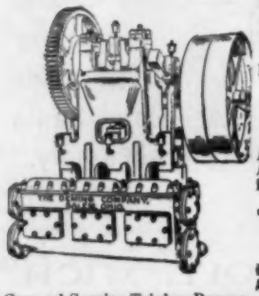

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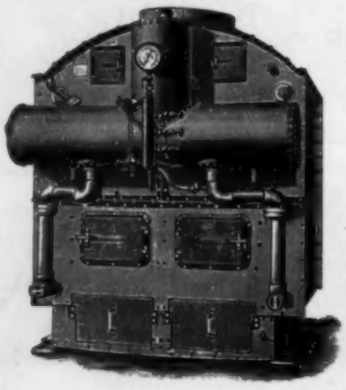

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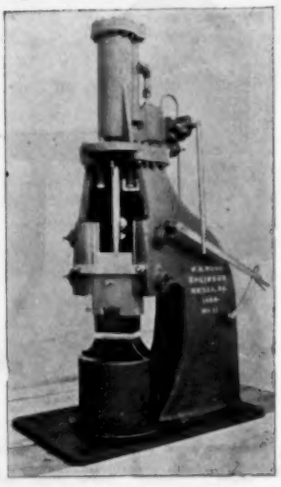

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Baltimore and Washington	* 1:40 pm	*11:25 am
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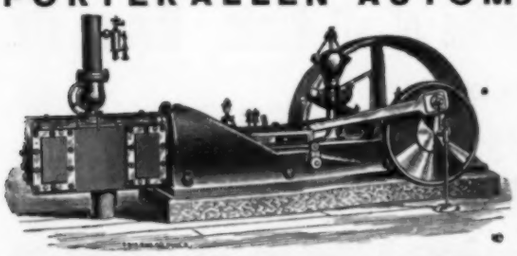

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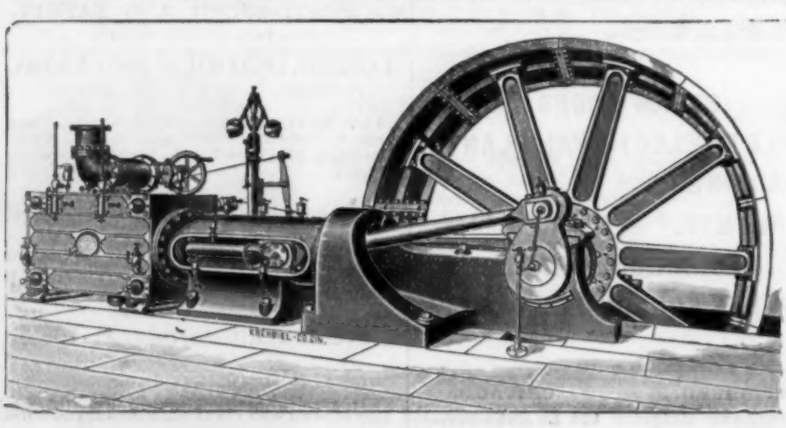

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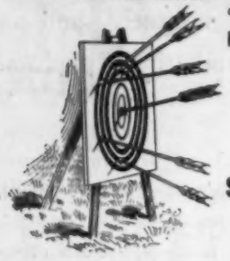

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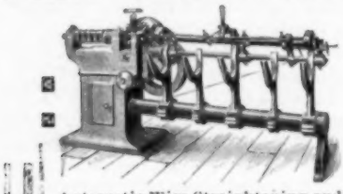

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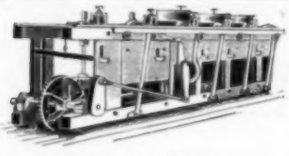

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C. H. Besly & Co., Chicago, Ill.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & &redge Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg
General Electric Co., Scheuectady, N. Y.
Card Electric Co., Mansfield, O.

Molding Sand—
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Newport Sand Bank Co., Newport, Ky.

Oilless Bearings—
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Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
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Diamond Machine Co., Providence, R. I.

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Jas. L. Robertson & Sons, New York.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.

Packing—
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Jenkins Bros., New York City.
Jas. L. Robertson & Sons, New York.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Allen Anti-Rust Mfg. Co., Cincinnati, O.

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Gobeille Pattern Co., Cleveland, O.

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Bertsch & Co., Cambridge City, Ind.
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Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Hughes Steam Pump Co., Cleveland, O.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

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Edward Brown, Philadelphia, Pa.

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Dietz, Schumacher & Boye, Cincinnati, O.

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Cleveland City Forge & Iron Co., Cleveland.

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Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.

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The Lloyd-Booth Co., Youngstown, O.

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Lorain Foundry Co., Lorain, O.

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Harrington & King Perforating Co., Chicago.

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Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

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Toledo Machine & Tool Co., Toledo, O.
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Ætna-Standard Iron & Steel Co., Bridgeport, O

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Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

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Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
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Jas L. Robertson & Sons, New York.

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Link-Belt Machinery Co., Chicago, Ill.

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Cleveland City Forge & Iron Co., Cleveland.
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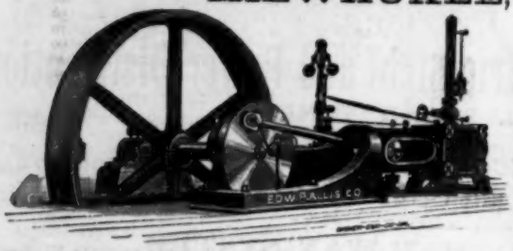

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3.46
No. 1 Specular, Bessemer	$3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.80
Hematites No. 1 non-Bessemer	2.20@ 2.30
No 1. Specular, non-Bessemer	2.40@ 2.60

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CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 75@ 9 90
No. 1 Strong Foundry	10 50@ 10 75
No. 2 Strong Foundry	10 00@ 10 25
No. 1 Gray Forge, red short	@ 8 90
No. 2 Gray Forge, neutral	9 00@ 9 15
No. 1 American Scotch	@ 10 90
No. 2 American Scotch	@ 10 40
Lake Superior Charcoal	@ 13 50
PITTSBURG:	
No. 1 Foundry	$10 25@ 10 50
No. 2 Foundry	9 90@ 10 15
Gray Forge	8 65@ 8 90
White and Mottled	@ 8 75
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	@ 18 00
Bessemer	9-75@ 9 90
CHICAGO:	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	11 25@ 11 75
Local Coke Foundry No. 2	10 75@ 11 25
Local Coke Foundry No. 3	10 50@ 10 75
Local Scotch Foundry No. 1	11 25@ 11 75
Local Scotch Foundry No. 2	10 75@ 11 25
Local Scotch Foundry No. 3	10 50@ 10 75
Southern Coke No. 1	11 00@ 11 20
Southern Coke No. 2	10 25@ 10 45
Southern Coke No. 3	10 00@ 10 10
Southern No. 1 Soft	10 65@ 10 95
Southern No. 2 Soft	10 15@ 10 23
Southern Silveries	11 40@ 11 65
Jackson Co. Silveries	14 00@ 16 00
Ohio Silveries No. 1	15 00@ 15 55
Ohio Silveries No. 2	14 50@ 15 05
Ohio Strong Softeners	12 00@ 12 20
Alabama Car Wheel	16 00@ 16 55
Malleable Bessemer	11 50@ 12 00
Coke Bessemer	13 00@ 13 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	9 50@$ 9 75
Southern Coke No. 2 and No. 1 Soft	9 00@ 9 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 75@ 15 75
Tennessee Charcoal No 1	12 75@ 12 75
Jackson County Silvery No 1	12 25@ 13 75
Southern Coke, Gray Forge	8 75@ 9 00
" " Mottled	@ 9 00
Standard Georgia Car Wheel	14 50@ 15 25
Tennessee " " "	13 25@ 14 20
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$ @$11 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	@ 11 00
Ohio Strong Softener No. 1	@ 11 50
Jackson Co. Silvery No. 1	@ 14 00
Lake Superior Charcoal	@ 14 00
Southern Soft No. 1	@ 11 00
Hanging Rock Charcoal	@ 17 00
ST. LOUIS:	
Southern Coke No 1	$ @$10 25
Southern Coke No. 2	@ 9 75
Southern Coke No. 3	@ 9 25
Southern Gray Forge	@ 9 00
Southern Charcoal No. 1	@ 15 00
Missouri Charcoal No. 1	@ 14 00
Ohio Softeners	@ 14 50
Lake Superior Car Wheel	@ 15 00
Southern Car Wheel	@ 15 00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$12 50
Old steel rails	10 50
Old car wheels	10 00
	NET TONS
No. 1 R. R. wrought scrap	$10 00
Mill scrap	7 50
No. 1 Machine cast scrap	8 50
Iron axles	14 00
Axle turnings	7 00
Wrought turnings (free from cast)	6 25
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.65c
Angles	1.10c
Tees	1.25c
Universal Plates	1.15@1.20c
Sheared Plates	1.22c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅝	1.10 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
6¼ to 6¾	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

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The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease

NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.

An Interesting and Instructive Pamphlet will be sent Free of Charge.

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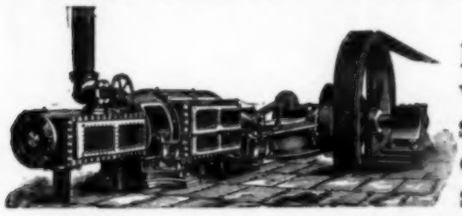
WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

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Park Building, Pittsburg,
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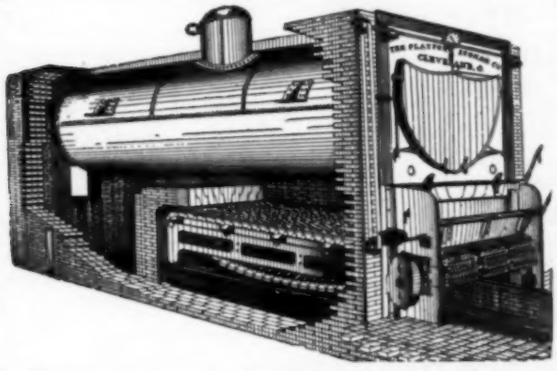

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Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

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The Playford Stoker Co.,

No. 61 Case Library Bldg.,

CLEVELAND, O

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

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ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¾	2.50 extra
⅜ to ⅝	.10 "
½ to 11-16	.20 "
⅝ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¾ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¾ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¾ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1¾ to 1⅞ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.30 "
¾ to 15-16 x ⅜ to ⅝	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¾ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¾ to 6 x No. 9 to 3-16	.50 "
4¾ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
½ to 13-16	.50 "
⅝ to 11-16	.60 "
¾ to 9-16	.80 "
⅞ to 7-16	1.10 "
½ to 9 16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.50 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4 50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1½ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¾,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1¾,	" 22	.25 "
1 ⅛ to 1¾,	" 13, 14 and 15	.05 "
1⅛ to 1¾	" 16, 17 and 18	.10 "

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179 BOQUET STREET, ALLEGHENY, PA.

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HEAVY DUTY GEARS

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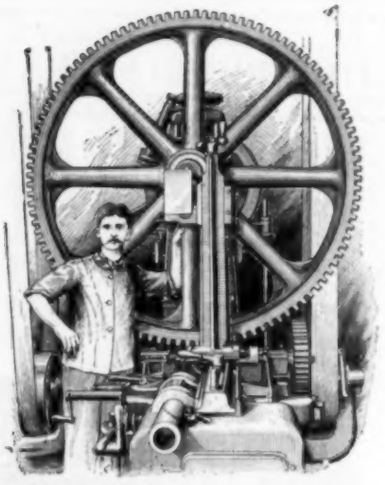
Bridge and Mining Work



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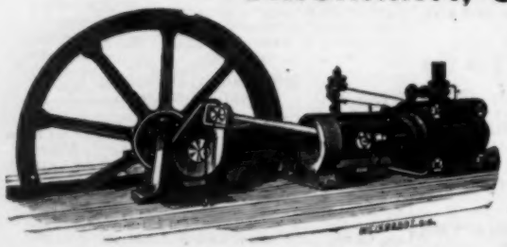

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ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝	"	23	.85 "
9 16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
⅜,	"	13, 14 and 15	1.00 "
⅜,	"	16, 17 and 18	1.10 "
⅜,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

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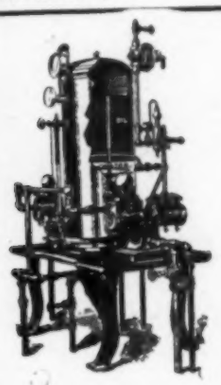

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General Freight Agent,
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Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ½ thick .08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts. lbs.

1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2½ to 3 in	.09
3½ to 4 in	.09½
⅝ to 11-16 and 4½	.10
⅝ to 6 in	.10½
¾ to 9-32 and 6½ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 60
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black	base,	four 10s		.62
Butt " "	"	four 10s		.62½
Lap " galv.	"	four 10s		.52½
Butt " "	"	four 10s		.50
Boiler tubes 2¼" and smaller				.70
Boiler tubes 2½" and larger				.75
Casting screw and socket joint			dis.	52½
Casing inserted joint			dis.	47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 45
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 3 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1¼"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60&60&5
Cleveland " "	dis 60&60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3⅛
Hexagon	15⅝	11⅝	8¾	6	5¾	5¼	
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
Car lots.....$1 40
Less than car lots.....$1.50

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 50
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@33
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10&7½
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75&10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

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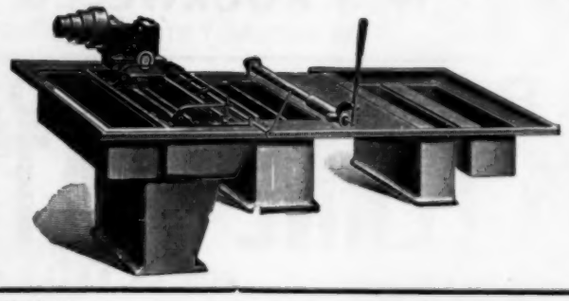

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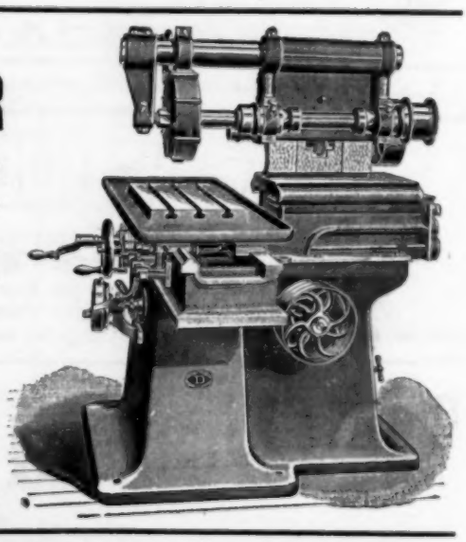

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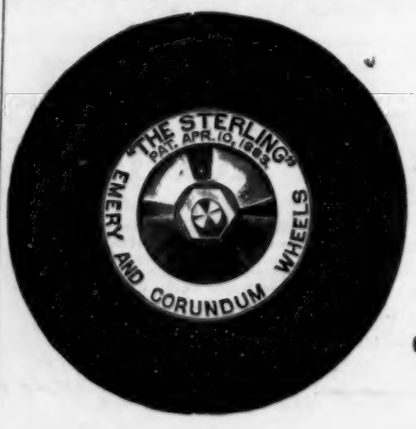

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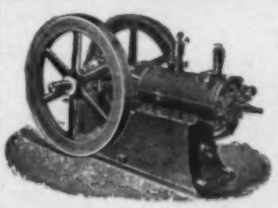

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All of these tools are the latest improved and just as good as new, and can be seen at our ware-rooms on Second Street, Cincinnati.

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Entire availability of yard room and cheapness of construction are among the advantages of this crane.

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ELECTRIC
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built for
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Write us for further description. We can build these cranes in whatever size and capacity may best suit your purpose.

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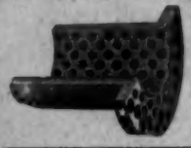

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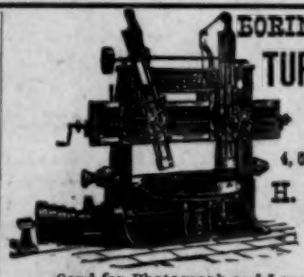

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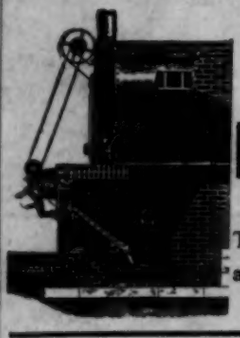

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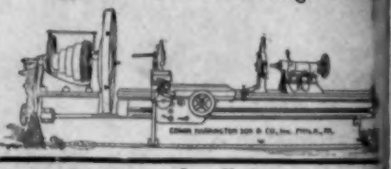

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